

Pathogen Management Kit

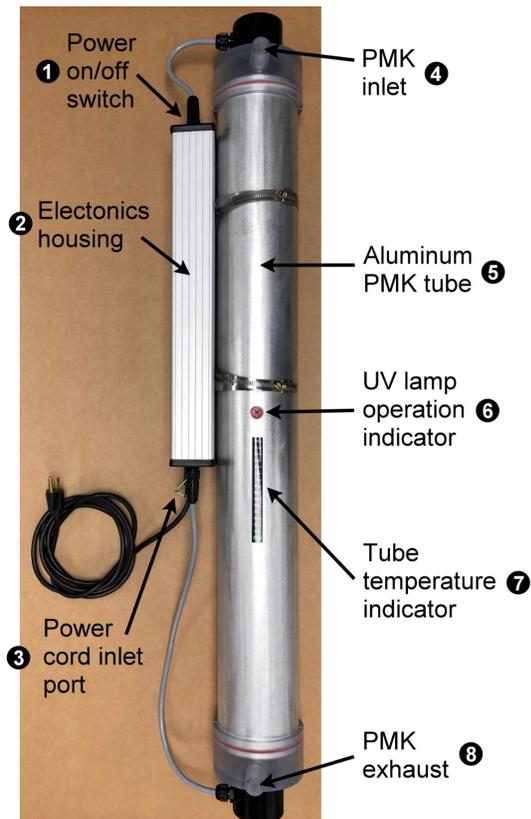
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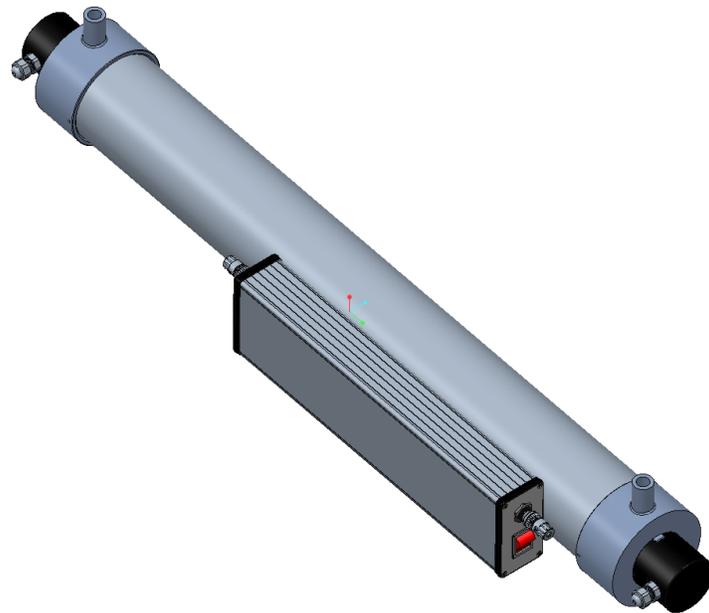


Point of contact: pmk1000@sandia.gov

Sandia National Laboratories (SNL) has developed and produced a simple add-on kit (Pathogen Management Kit, or PMK) that can quickly add on to ventilators of all types to disinfect exhaled air to keep healthcare workers safe.

The PMK design consists of a polished aluminum tube that amplifies energy from embedded UV light to decontaminate the exhaled breath by disabling pathogens that pass through. The PMK was developed, built, and tested to ensure sufficient exposure of the entrained pathogens to UV energy. Using a UV light source to kill pathogens, rather than a filter, eliminates the possibility of clogging that is commonly experienced with HEPA designs. The unit was tested with the Phillips Respironics V60; however, because the unit does not add any flow resistance, it could be retrofitted into other existing respiratory assistance devices. The design utilizes commonly sourced, commercially available, off the shelf parts, with only a few requiring custom manufacturing. To prove the effectiveness of the device, SNL deployed UV exposure measurements coupled with light-propagation modeling to ensure the design had significant margin over what would be required to kill live coronavirus. SNL's unique aerosol test facility also was used to ensure the design sufficiently killed live biologicals commonly used to simulate the coronavirus.





The method of air flow sterilization is high-intensity UV irradiation at a wavelength of 254 nm. The sterilization unit uses a commercially available G30 T8 UV germicidal lamp and is treated so as to not generate ozone. The bulb is identical in form factor to a standard T8, 36-inch-long fluorescent light tube. The germicidal lamp is housed inside a 36-inch-long outer tube whose interior surface is polished for high UV reflectivity, which enhances the viral kill factor. The efficacy of this sterilization unit was first tested with the surrogate virus phage MS2, which has shown to be more resistant to UV than coronaviruses and killed 99.87% of the MS2 phage.

The electrical components are contained in a separate enclosure; the unit is powered by a standard T8 fluorescent lamp ballast, requiring a standard 120 V outlet. None of the electrical hookups are subject to a hot or humid environment. The electrical enclosure and tube are both grounded. The unit is operated by a rocker switch at the top of the panel. The PMK is assembled to support maintenance, if needed (the standard lamp operating time is ~8000 hours). The device features a visual indicator to ensure the device is operating.

Sterilizer Unit Technical specifications

Size: 39" x 8" x 5" (estimated)

Weight: 5 kg (estimated)

Electrical power consumption: 30 W, (uses standard 120 V outlet)

Lamp: G30 T8 germicidal lamp

Consumables other than electricity: none

Maximum rated air flow: 30 L/min average with fluctuations for 100 L/min coughs

Tested decontamination efficacy at max flow rate: 99.87%

Application setting: Hospital room