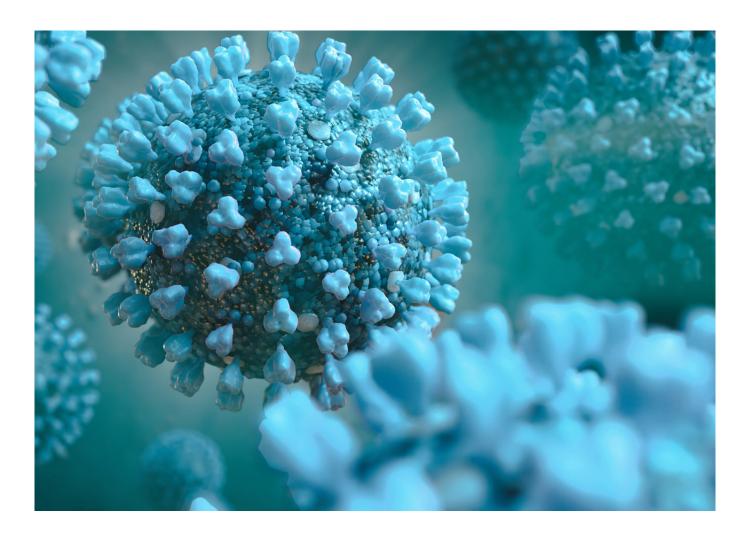




Isolation Rooms Emergency air filters for airborne virus control



Controlling the spread of life-threatening diseases often means adapting and improvising – such as creating isolation rooms away from the confines of a hospital.

INTRODUCTION

In emergency situations, such as outbreaks of life-threatening diseases, epidemics or even pandemics, urgent action must be taken to inhibit the spread of the disease and its transmitters.

One such action is the creation of temporary isolation rooms to host and care for the sick while protecting the wider population.

Our whitepaper provides an introduction to high efficiency (HEPA) air filters that are

used to create isolation rooms and ensure that contaminated air cannot reach the wider environment.

We look at how HEPA filters should be employed, how to handle high efficiency filters, and what you need to consider when modifying the ventilation system to enable their installation. Lastly, we also provide a brief overview of the MANN+HUMMEL range of HEPA filters, including which filter type is most relevant to your application.

HEPA Filters At the heart of an isolation room

HEPA FILTERS - WHAT ARE THEY?

HEPA (High Efficiency Particulate Air) filters are used for airborne contamination control and are classified H13 or H14 according to the EN 1822 standard.

These classifications guarantee a separation efficiency of 99.95% (H13) or 99.995% (H14) with particles at the Most Penetrating Particle Size (MPPS), which is typically in the range of 0.12 to 0.25 μm – about the size of many types of virus

HEPA filters are used for a wide range of different applications, but typically serve three broad purposes:

HEPA APPLICATIONS



SUPPLY AIR

To create a clean environment inside a room by removing harmful or dangerous particulate from the incoming air flow.



EXHAUST AIR

To ensure that the air leaving a room is clean and safe, and does not pose a threat to the wider environment.



VENTILATION SYSTEMS

To prevent the spread of contamination through the ventilation system.



HEPA filters can capture particles that are just 0.1 μ m in diameter. To put this into perspective, a human hair typically has a diameter in the region of 70 μ m.

Isolation Rooms Containing the threat

WHAT IS NEEDED TO CREATE AN ISOLATION ROOM?

No matter if they are temporary or permanent, big or small, all isolation rooms share a few common characteristics.

The exhaust air flow is greater than supply air flow

This creates a negative pressure so that the air from the surrounding rooms is pressed into the isolation room instead of escaping. In other words, if there is a negative pressure in the isolation room compared to the next room or corridor, then airborne contaminants (such as viruses) cannot escape from the isolation or quarantine room.

The exhaust air terminal is equipped with a HEPA

The HEPA filter will capture particles, viruses, bacteria so they cannot enter the air duct system or the air handling unit (AHU). Make sure the exhaust air duct and filter box are as leakage free as possible, and that the filter housing is appropriately gas-tight and can be subjected to a leakage measurement (DEHS test according to ISO 14644-3).

FILTER CLASS CHANGE: THE IMPACT ON AIR FLOW

Adding a HEPA filter housing in place of the standard exhaust air terminal will increase the pressure loss of this part of the ventilation system.

A change from ePM10 (formerly M5/M6) pocket filters to HEPA filter class in the air handling unit will also increase the pressure drop of the exhaust air flow. If there is no variable air flow control in the air handling unit, the air flows must be adjusted manually (after checking the maximum pressure of the built-in fans).

THE CHALLENGE OF PREFILTRATION

A HEPA filter is generally used together with a prefiltration stage (such as ePM1 50% or ePM1 80%, formerly known as F7 or F9) to capture larger particulate that would otherwise clog the high efficiency filter – shortening its service life.

In the case of temporary or mobile isolation rooms, a prefiltration stage is not always possible due to the limited space in the ventilation system. This can present a variety of challenges.

Firstly, with no prefilter to capture the larger particulate, a HEPA filter will face higher dust loads, meaning it will load faster and need to be changed more quickly than typical HEPA filter applications.

The second challenge arises in applications with high relative humidity. In such environments, the prefilters protect the downstream HEPAs from the moisture in the air.

Without this protection, standard HEPA filter paper can be damaged by high humidity – potentially leading to filter failure.

We recommend that in applications with high relative humidity standard HEPA filters should only be employed where prefiltration is possible.

Where prefiltration is not possible, moisture-resistant HEPA media should be used. This specially-designed media resists moisture and is able to withstand the demands of operating in a high humidity environment.

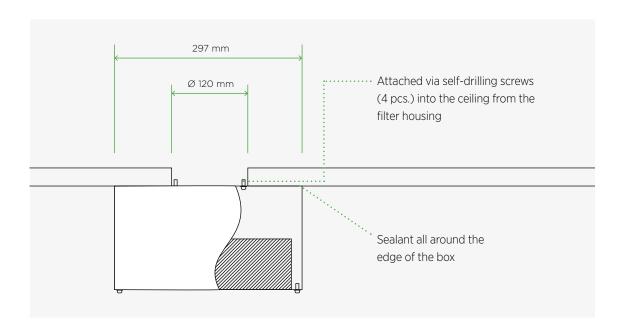
The air flow may reduce due to higher pressure drops during times of extremely high humidity, but the filter operation and performance will return to normal as soon as the filter media is dry again.



MANN+HUMMEL's Nanoclass Square Pro Membrane is built to withstand the moisture that operating without a prefilter can bring. See page 6 for more...

HEPA Filters Installation and Disposal

FILTER INSTALLATION DIAGRAM



INSTALLING A HEPA AND FILTER BOX

A leak-free installation of the HEPA filter and the filter box is essential to ensure that contaminants do not reach the exhaust air duct. To achieve this, we recommend that you seal the upper edge of the housing against the ceiling (for example with silicone).

For mechanical fixation to the ceiling, we recommend self-drilling screws adapted to the material used in the ceiling. There are no screw holes in the housing on delivery, this needs to be arranged based on the type and number of screws required for each installation.

Adequate fixing of the filter housing is in the responsibility of the installer. The total weight of the HEPA filter box including filter is approximately 8 kg.

GENERAL HEPA INSTALLATION ADVICE

- Do not touch the HEPA filter media. Touching will contaminate and potentially damage the media.
- To ensure full filtration performance the filter must be leak free. Make sure that the gasket is pointing upwards in the HEPA box.

HEPA FILTER REMOVAL AND DISPOSAL

- Remember that used HEPA filters contain virus particles. When handling a used filter, adhere to all necessary actions needed to prevent contamination of service staff as well as of the ventilation system or room itself. Do not touch the filter media!
- The used HEPA filter must be handled and disposed of as contaminated waste.



HEPA filters are built in cleanroom conditions to ensure that no contamination is present upon installation.

Touching the media can leave germs, viruses and other particulates on the surface of the filter, and also risks damaging the media.

HEPA Filters The MANN+HUMMEL Range



1

NANOCLASS SQUARE PRO MEMBRANE FC

- High efficiency
- Available in depths of 69 and 90 mm
- High tensile strength
- 100% boron free
- Minipleat technology for laminar flow
- Extremely low pressure drop
- Guaranteed leak free

2

NANOCLASS SQUARE ECO

- High efficiency
- Available in filter classes E11 to U16
- Available in depths of 69, 78, 90, 110 and 150 mm
- Minipleat technology for laminar flow
- Low pressure drop
- Guaranteed leak free

3

NANOCLASS CUBE N ECO

- For high air volumes up to 4,000 m³/h
- Compact, space-saving design
- Large active media area
- Rigid and robust
- Optional plastic frame is incinerable and lightweight



For further information on any of these products or in-depth advice about establishing emergency isolation rooms, please contact your local MANN+HUMMEL representative or visit our website: airfiltration.mann-hummel.com

HEPA Filters The MANN+HUMMEL Range





NANOCLASS CUBE PRO

- Fits all commonly used filter frames
- Industry-leading burst resistance
- Fully incinerable
- Recyclable materials for simple, environmentally-friendly disposal
- High efficiencies at low pressure drops

5

FILTERBOX

- Designed for use with Nanoclass Square
 Pro Membrane FC
- Available with circular connection of Ø 90 mm or Ø 120 mm
- Connection positioned at center of box or on the side
- Outer dimensions 302 x 302 x 125 mm
- Provides a leak-free HEPA installation
- Powder-coated RAL9001 metal case

6

DTM HOOD

- Designed for supply air in hospitals
- Constructed in lightweight aluminum
- Fully disposable design
- Integrated H13 or H14 HEPA filter
- Integral diffusor with epoxy-coated protective grill
- Simple to install
- Standard size 595 x 595 x 150 mm with Ø 350 mm spigot connection



