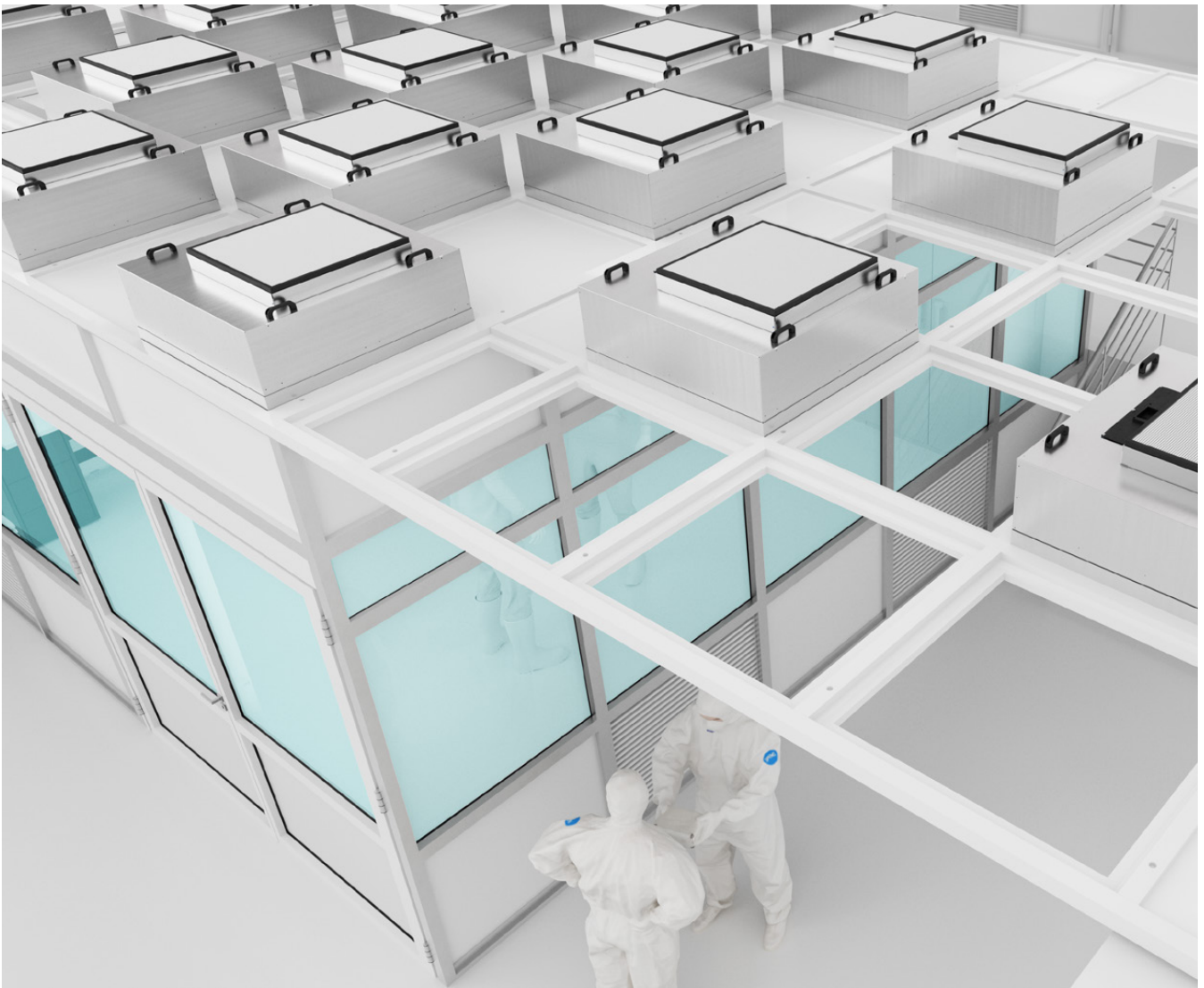


# Nanoclass FFU: High purity elements for cleanrooms



# Nanoclass FFU



## THE ALL-IN-ONE SOLUTION IN A LEAGUE OF ITS OWN

Combining best-in-class energy consumption and noise output with the reliability and filtration performance you would expect from a MANN+HUMMEL product, Nanoclass FFU offers simply unmatched performance.

And, with a range of filter fan units—each with a variety of different filter options—Nanoclass FFU is not just the wise choice, it's the easy choice too.

# Why choose Nanoclass FFU?



All-round solution—housing, HEPA filter, fan and control system



Modular and lightweight for faster installation with less disruption



Energy efficient for lower, eco-friendly running costs



Flexible and adaptable to meet the needs of agile production lines



Low noise emissions



An economically better investment than ducted supply air systems



Available with or without an integrated prefiltration stage



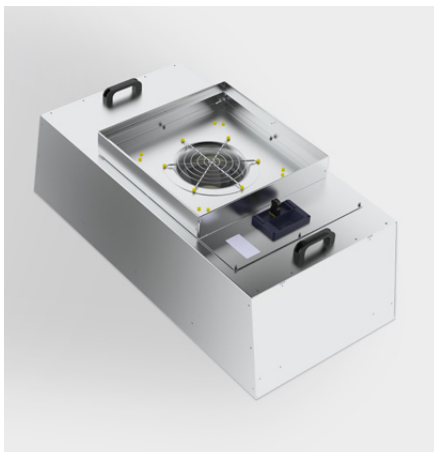
Available with optional cooling system



Final filter installation from the cleanroom or plenum side



Ideal for creating micro clean air zones for work spaces or process cabinets



Together with the cleanroom community, we developed Nanoclass FFU to meet the highest of requirements—with installations in place around the globe.

# Designed to perform, built to last!

Made from 1.5 mm thick untreated aluminum. Other thicknesses and materials—such as stainless steel and powder coatings (e.g. RAL9010)—are also available.

For easy handling, each unit has two or four handles on top, depending on the size of the housing.

Compatible with most common ceiling systems and integrate seamlessly into cleanroom machines or systems.

Proven, energy-efficient drives that are made in Germany and use modern, backward-curved EC centrifugal fans

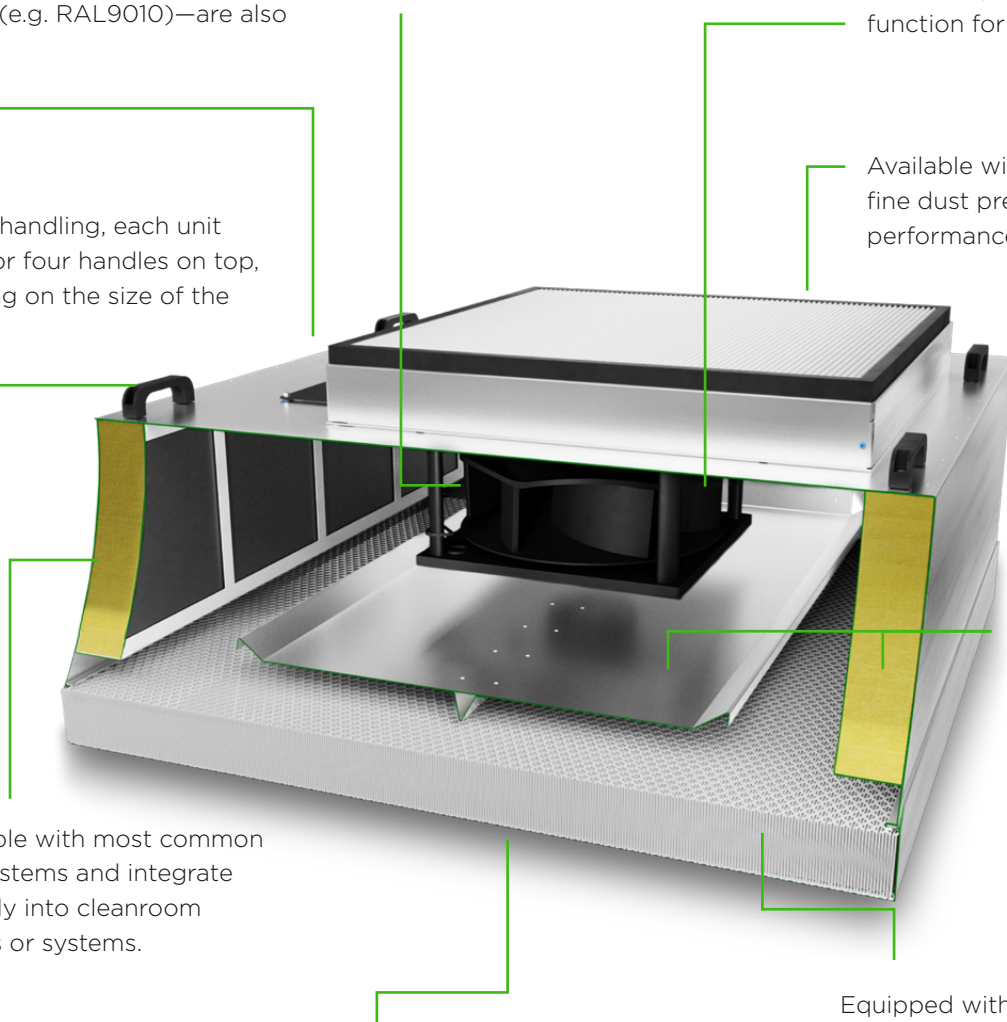
System control is via MODBUS-RTU interface and 0-10 V analog input, or MODBUS-RTU units with DCI (daisy chain interface) function for auto-addressing

Available with various coarse and fine dust prefilters, and/or high performance molecular filters

Optimized air flow and integrated sound absorbers ensure low noise emissions at all operating points

Available in the six common grid sizes 0606, 0609, 0612, 0909, 0912 and 1212.

Equipped with high quality HEPA or ULPA filters in classes H14 – U17 (to EN 1822), which can be changed from above or below



# Energy saving to protect your budget

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Your process reliability is our top priority. But we also know that energy is a significant part of the total cost of ownership of an air filtration system. That is why we have designed the Nanoclass FFU to offer unrivalled energy efficiency.

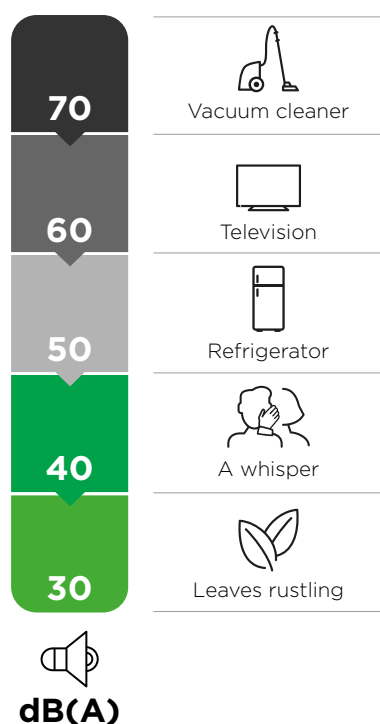


Offering up to 20% lower energy consumption and CO<sub>2</sub> footprint than comparable products, Nanoclass FFU boasts a number of features that can help cut your energy bill.

The integrated fan is powered by the latest energy-efficient drives to reduce the electrical demand of each unit. All filter options feature low pressure drops to minimize the air flow resistance. And the flexible control modules enable you to power your filter fan system as and when you need it.

# Whisper-quiet performance

A quiet hum can quickly turn into an annoying drone—particularly in working spaces. All Nanoclass FFUs feature an extremely low sound output for unobtrusive performance.



A commonly-held belief is that filter fan units can be noisy, which makes them unsuitable for use in groups or anywhere except small applications.

Indeed, some FFUs can be noisy. But Nanoclass FFU offers the quietest performance on the market.

So much so, that several of our filter fan units can even be used in combination in sound-sensitive areas.

\*Grid size 0612, ePM10 50% and HEPA H14, 0.45 m/s at 1.5 m

**Nanoclass FFU EF**  
**39.5 dB(A)\***

**Nanoclass FFU Select**  
**44 dB(A)\***

## A small change can make a big difference

Noise emissions are not linear, so even a slight increase in the decibel level can feel like a significant rise.

**+3 dBA** – corresponds to doubling the *sound intensity*

**+6 dBA** – feels like quadrupling the *sound intensity*

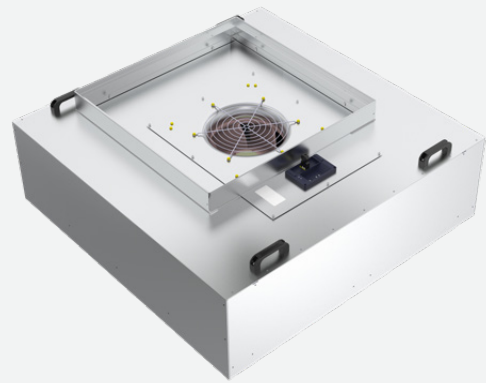
**+10 dBA** – has the sensation of doubling the *volume*

# The Nanoclass FFU range

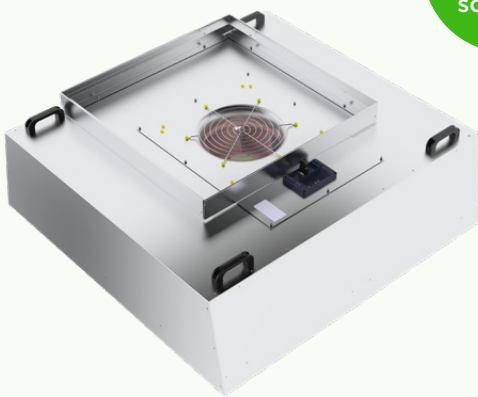
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**Nanoclass FFU Access**  
Budget-friendly performance



**Nanoclass FFU Select**  
Reliable and well-proven in the field



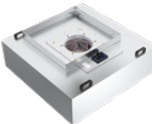
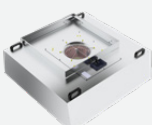
**Nanoclass FFU EF**  
Unrivalled performance - best in class for  
energy efficiency and low noise levels

Market-  
leading  
solution



**Nanoclass FFU RSI**  
Room-side installation

# Technical overview

| Nanoclass FFU                                                                                      | Dimensions<br>mm  | Weight<br>kg | Energy<br>cons.<br>W | Sound<br>pressure*<br>dB(A) | Protection<br>class | Voltage<br>V | Frequency<br>Hz | Power<br>max.<br>W | Current<br>max.<br>A |
|----------------------------------------------------------------------------------------------------|-------------------|--------------|----------------------|-----------------------------|---------------------|--------------|-----------------|--------------------|----------------------|
| <br><b>Access</b> | 562 x 1162 x 335  | 17.5         | 141                  | 47                          | IP20 / IP55         | 1 - 220-277V | 50/60           | 315                | 1.37                 |
|                                                                                                    | 1162 x 1162 x 335 | 22           | 238                  | 52                          |                     |              |                 |                    |                      |
| <br><b>Select</b> | 562 x 1162 x 350  | 20.5         | 95                   | 44                          | IP20 / IP55         | 1 - 220-277V | 50/60           | 500                | 2.2                  |
|                                                                                                    | 1162 x 1162 x 350 | 29.5         | 220                  | 51                          |                     |              |                 |                    |                      |
| <br><b>EF</b>   | 562 x 1162 x 350  | 19.5         | 72                   | 39.5                        | IP20 / IP55         | 1 - 220-277V | 50/60           | 500                | 2.2                  |
|                                                                                                    | 1162 x 1162 x 350 | 28.5         | 170                  | 43                          |                     |              |                 |                    |                      |
| <br><b>RSI</b>  | 562 x 1162 x 350  | 22           | 95                   | 47                          | IP20 / IP55         | 1 - 220-277V | 50/60           | 500                | 2.2                  |
|                                                                                                    | 1162 x 1162 x 350 | 31           | 220                  | 52                          |                     |              |                 |                    |                      |

Testing Parameters: prefilter – ePM10 50%, main filter – HEPA H14

\*Distance 1.5 m after HEPA

# Nanoclass FFU Access



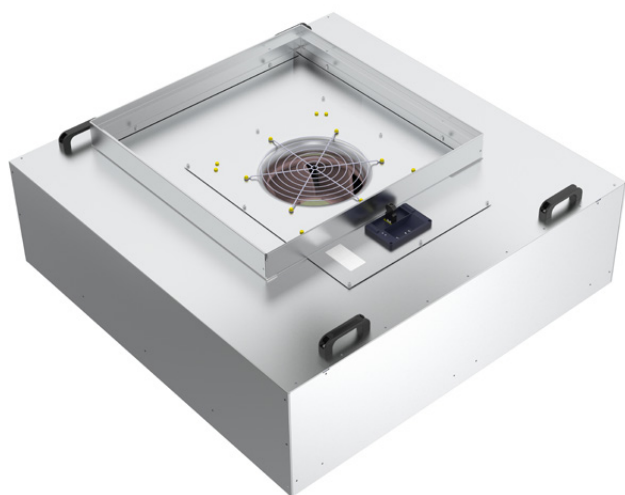
## For budget-friendly performance

- Standard dimensions for high-runner grid sizes
- Other dimensions available
- Provided with and without a prefilter frame
- Very light weight
- Moderate energy consumption and noise emissions
- Designed with focus on price-driven applications

| Grid size | Dimensions (mm) |      |     | Prefilter frame (mm) |     |    | Connection & control | Weight (kg) | Air volume (m³/h) | Noise emissions (dBA)* |
|-----------|-----------------|------|-----|----------------------|-----|----|----------------------|-------------|-------------------|------------------------|
|           | W               | H    | D   | W                    | H   | D  | MODBUS RTU           |             |                   |                        |
| 1212      | 1162            | 1162 | 320 | 750                  | 750 | 80 | ✓                    | 22          | 2220              | 52                     |
|           | 1132            | 1132 | 300 |                      |     |    |                      | 21.5        |                   |                        |
| 0612      | 562             | 1162 | 300 | 500                  | 500 | 80 | ✓                    | 17.5        | 1100              | 48                     |
|           | 532             | 1132 | 300 |                      |     |    |                      | 17          |                   |                        |

\*ePM10 50% prefilter and H14 main filter with 0.45 m/s air velocity at 1.5 m below HEPA

# Nanoclass FFU Select



## For proven and reliable performance

- Dimensions for all standard grid sizes
- Other dimensions available
- Provided with and without a prefilter frame
- Light weight filter fan unit
- Available for digital (Modbus RTU) and analog (0-10V) control
- Modbus DCI available
- Low energy consumption
- Lowest noise emission in it's class
- Designed for long-lasting and stable performance

| Grid size | Dimensions (mm) |      |     | Prefilter frame (mm) |     |    | Connection & control |              | Weight (kg) | Air volume (m³/h) | Noise emissions (dBA)* |
|-----------|-----------------|------|-----|----------------------|-----|----|----------------------|--------------|-------------|-------------------|------------------------|
|           | W               | H    | D   | W                    | H   | D  | MODBUS RTU/0-10V     | Wieland plug |             |                   |                        |
| 1212      | 1162            | 1162 | 350 | 750                  | 750 | 80 | ✓                    | Included     | 29.5        | 2220              | 51                     |
|           | 1132            | 1132 | 350 |                      |     |    |                      |              | 29          |                   |                        |
| 0912      | 862             | 1162 | 350 | 750                  | 750 | 80 | ✓                    | Included     | 26          | 1650              | 47                     |
|           | 832             | 1132 | 350 |                      |     |    |                      |              | 25.5        |                   |                        |
| 0909      | 862             | 862  | 350 | 500                  | 500 | 80 | ✓                    | Included     | 22.5        | 1230              | 45                     |
|           | 832             | 832  | 350 |                      |     |    |                      |              | 22          |                   |                        |
| 0612      | 562             | 1162 | 350 | 500                  | 500 | 80 | ✓                    | Included     | 20.5        | 1100              | 44                     |
|           | 532             | 1132 | 350 |                      |     |    |                      |              | 20          |                   |                        |
| 0609      | 562             | 862  | 350 | 500                  | 500 | 80 | ✓                    | Included     | 18          | 800               | 45                     |
|           | 532             | 832  | 350 |                      |     |    |                      |              | 17.5        |                   |                        |
| 0606      | 562             | 562  | 350 | 380                  | 450 | 80 | ✓                    | Included     | 12.5        | 530               | 47                     |
|           | 532             | 532  | 350 |                      |     |    |                      |              | 12          |                   |                        |

\*ePM10 50% and HEPA H14, 0.45 m/s at 1.5 m

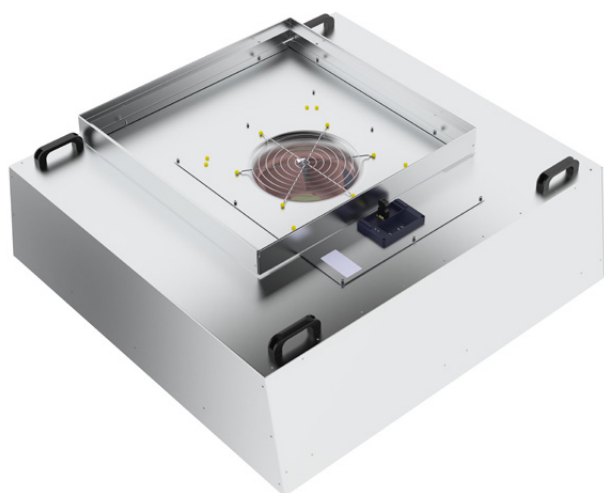
# Nanoclass FFU EF



Patented



MADE IN  
GERMANY



## For simply unmatched performance

- Market-leading for performance, energy efficiency and noise level
- 20% lower energy consumption and CO<sub>2</sub> footprint
- Dimensions for all standard grid sizes
- Other dimensions available
- Provided with and without a prefilter frame
- Light weight
- Available for digital (Modbus RTU) and analog (0-10V) control
- Best-in-class noise emissions
- Designed for the highest performance standards
- Patented solution

| Grid size | Dimensions (mm) |      |     | Prefilter frame (mm) |     |    | Connection & control |              | Weight (kg) | Air volume (m <sup>3</sup> /h) | Noise emissions (dBA)* |
|-----------|-----------------|------|-----|----------------------|-----|----|----------------------|--------------|-------------|--------------------------------|------------------------|
|           | W               | H    | D   | W                    | H   | D  | MODBUS 0-10V         | Wieland plug |             |                                |                        |
| 1212      | 1162            | 1162 | 350 | 750                  | 750 | 80 | ✓                    | Included     | 28.5        | 2220                           | 43                     |
|           | 1132            | 1132 | 350 |                      |     |    |                      |              | 28          |                                |                        |
| 0912      | 862             | 1162 | 350 | 750                  | 750 | 80 | ✓                    | Included     | 25          | 1650                           | 42                     |
|           | 832             | 1132 | 350 |                      |     |    |                      |              | 24.5        |                                |                        |
| 0909      | 862             | 862  | 350 | 500                  | 500 | 80 | ✓                    | Included     | 21.5        | 1230                           | 41                     |
|           | 832             | 832  | 350 |                      |     |    |                      |              | 21          |                                |                        |
| 0612      | 562             | 1162 | 350 | 500                  | 500 | 80 | ✓                    | Included     | 19.5        | 1100                           | 39.5                   |
|           | 532             | 1132 | 350 |                      |     |    |                      |              | 19          |                                |                        |
| 0609      | 562             | 862  | 350 | 500                  | 500 | 80 | ✓                    | Included     | 17          | 800                            | 41                     |
|           | 532             | 832  | 350 |                      |     |    |                      |              | 16          |                                |                        |
| 0606      | 562             | 562  | 350 | 380                  | 450 | 80 | ✓                    | Included     | 11.5        | 530                            | 43                     |
|           | 532             | 532  | 350 |                      |     |    |                      |              | 11          |                                |                        |

\*ePM10 50% and HEPA H14, 0.45 m/s at 1.5 m

# Nanoclass FFU RSI



Patented



MADE IN GERMANY



## For room-side installation

- Standard dimensions for high-runner grid sizes
- Other dimensions available
- Provided with and without a prefilter frame
- Light weight
- Available for digital (Modbus RTU) and analog (0-10V) control
- Low energy consumption
- Low noise emissions
- Designed for efficient and reliable cleanroom side installations and replacements
- Patented solution

| Grid size | Dimensions (mm) |      |     | Prefilter frame (mm) |     |    | Connection & control |              | Weight (kg) | Air volume (m³/h) | Noise emissions (dBA)* |
|-----------|-----------------|------|-----|----------------------|-----|----|----------------------|--------------|-------------|-------------------|------------------------|
|           | W               | H    | D   | W                    | H   | D  | MODBUS 0-10V         | Wieland plug |             |                   |                        |
| 1212      | 1162            | 1162 | 350 | 750                  | 750 | 80 | ✓                    | Included     | 31          | 2220              | 51                     |
|           | 1132            | 1132 | 350 |                      |     |    |                      |              | 30.5        |                   |                        |
| 0612      | 562             | 1162 | 350 | 500                  | 500 | 80 | ✓                    | Included     | 22          | 1100              | 44                     |
|           | 532             | 1132 | 350 |                      |     |    |                      |              | 21.5        |                   |                        |

\*ePM10 50% and HEPA H14, 0.45 m/s at 1.5 m

# Final filtration that's guaranteed leak free

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## THE HIGHEST POSSIBLE STANDARDS AND SAFETY

Nanoclass FFU is equipped with high quality HEPA or ULPA filter elements that offer high filtration efficiencies from class H14 to U17 (according to EN 1822).

To ensure zero leakage and smooth commissioning, each of our HEPA

and ULPA filters is factory tested according to all applicable standards.

As an alternative to the traditional glass fiber media, ePTFE HEPA and ULPA filters with extremely low initial pressure drop performance can be specified as an option.



Each product in the Nanoclass Square EF range features a microglass paper medium that's minipleated, and fixed into a rigid and robust aluminum frame.

# Primary filter options

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At the heart of every Nanoclass FFU lies its primary filter. Two options are available—a knife-edge filter for changing from above and a gel-seal product for room-side replacement.



## Nanoclass Square EF KE



Access



Select



EF



RSI

With its integral knife edge, Nanoclass Square EF KE ensures a perfect seal between filter and housing everytime.



## Nanoclass Square EF TC



Access



Select



EF



RSI

Nanoclass Square EF TC features a fluid-gel gasket recessed into its aluminum frame. This gasket enables a leak-free seal when changing the filter from the room side. This solution works in combination with an adapter frame—the room side change frame (RSC) is an extruded aluminium frame.

# Room-side change for FFU Access/EF/Select

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In-room filter replacement eliminates lengthy cleanroom shutdowns and the need to work within the ceiling system above.



The RSC adaptor frame makes it possible to change the primary HEPA filter from the cleanroom side in the Access, Select and EF models.

The RSC adaptor frame is installed on the ceiling grid and the Nanoclass FFU is then simply placed on top. Both parts are installed once from the ceiling side and enable the final filter to be changed from within the cleanroom, instead of from above.

This allows maintenance to be completed with less disruption, and enables cleanroom operations to resume more quickly – minimizing productivity loss.

# Prefiltration that's right for any environment

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## PREFILTER'S PERFECT FOR CLEANROOM

Although prefilters play a supporting role—protecting more expensive final filters from becoming damaged by larger particulate—they can still have a significant impact on the efficiency and the total cost of ownership of the FFU system as a whole.

That's why we have selected a range of prefilters that offer the perfect ba-

lance between high filtration efficiency and low pressure drop.

And, to ensure that our prefilters provide the right type of protection, Nanoclass FFU can be fitted with coarse or fine dust prefilters, or even a molecular filtration stage for targeting gaseous contaminants.



We've selected prefilters that are ideal for use in cleanroom environments—with features like zero-shedding filter media, and frames that are resistant to oxidization and moisture.

# Airborne molecular contamination (AMC)

## WHAT IS AMC?

AMC appears in the form of gases, vapors or aerosols. The chemical nature can be organic, inorganic, or mixed. It plays an increasingly important role in cleanroom processes.

AMC can be detrimental to many processes, people, and products, causing corrosion, condensation, contamination of the final product, odors and health hazards.



## SOURCES OF AMC

AMC arises from an almost endless and often unexpected range of sources. Key sources include:

|                                                                                                                              |                                                                                                                         |                                                                                                                              |                                                                                                                                   |                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <br>People                                | <br>Outdoor air                      | <br>Manufacturing processes               | <br>Accidental spillage                       | <br>Solvents: cleaning, lithography             |
| <br>Outgassing of equipment and materials | <br>Emissions from process equipment | <br>Contamination across production areas | <br>Storage areas for chemicals and materials | <br>Wet cleaning, wet and dry-etching processes |

# Types of AMC

## TYPICAL GASES (DERIVED FROM THE WORK OF THE GASES GLOBAL TECHNICAL COMMITTEE)

| Acids                                                                                                                                                                                                                                                                                        | Bases                                                                                                                                                                                                                                                                                                                          | Condensables*                                                                                                                                                                                    | Dopants                                                                                                                                                                    | Metals**                                                                                                                                                                                           |                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Hydrofluoric acid (HF)</li> <li>Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>)</li> <li>Hydrochloric acid (HCl)</li> <li>Nitric acid (HNO<sub>3</sub>)</li> <li>Phosphoric acid (H<sub>3</sub>PO<sub>4</sub>)</li> <li>Hydrobromic acid (HBr)</li> </ul> | <ul style="list-style-type: none"> <li>Ammonia</li> <li>N-Methyl-2-pyrrolidone (NMP)</li> <li>Triethylamine (TEA)</li> <li>Trimethylamine (TMA)</li> <li>Tetramethylammonium-hydroxide (TMAH)</li> <li>Cyclohexylamine</li> <li>Diethylaminoethanol</li> <li>Methylamine</li> <li>Dimethylamine</li> <li>Morpholine</li> </ul> | <ul style="list-style-type: none"> <li>Silicones (from sealants, O-rings, lubricants)</li> <li>Hydrocarbon</li> <li>Plasticizers</li> <li>(from floor tiles, vinyl materials, gloves)</li> </ul> | <ul style="list-style-type: none"> <li>Boron (usually as boric acid)</li> <li>Phosphorous (usually as organophosphates)</li> <li>Arsenic (usually as arsenates)</li> </ul> | <ul style="list-style-type: none"> <li>Al</li> <li>Cu</li> <li>W</li> <li>Li</li> <li>Na</li> <li>K</li> <li>Mn</li> <li>Mg</li> <li>Co</li> <li>Cr</li> <li>Pb</li> <li>Mo</li> <li>Ni</li> </ul> | <ul style="list-style-type: none"> <li>Sn</li> <li>Zn</li> <li>V</li> <li>Ti</li> <li>Zr</li> <li>Hf</li> <li>Bi</li> <li>Nb</li> <li>Sr</li> <li>In</li> <li>Ge</li> <li>La</li> </ul> |

\*Condensables as defined by SEMI (boiling point >150 °C)

\*\*Not in metallic form, but as volatile chemical compounds

## CLASSIFICATION OF AMC ACCORDING TO SEMI F21-1016

SEMI F21-1016 classifies microelectronics clean environments in respect of their molecular contaminant levels. The classification provides a consistent way of establishing acceptable levels of various molecular contaminant groups. The following groups are classified: Acids (MA), Bases (MB), Condensables (MC), Dopants (MD) and Metals (MM).



Effective protection against airborne molecular contaminants is essential for both product yields and process safety.

# Prefilter options

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All Nanoclass FFU versions are available with any prefilter type—so you can configure the ideal solution for you.



## **Airpanel Select FZL**

**Particle filtration – Coarse 70%**

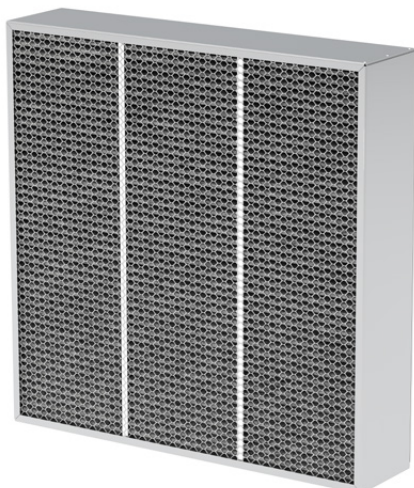
A pleated, synthetic filter medium with hotmelt spacers ensures that Airpanel Select FZL can deliver the reliability needed for cleanroom applications.



## **Airpanel EF S**

**Fine dust filter – ePM10 50%**

With a large, synthetic filter media packed into its rigid plastic frame, Airpanel EF S combines a long service life with zero risk of fiber shedding—perfect for the demands of cleanrooms.



## **Carboactiv Panel**

**Molecular filter**

Molecular filter panels for cleanroom ceilings, fan filter units, mini-environments or process equipment. Panels features low outgassing and high cleanliness.

# Filter technical data

## NANOCCLASS FFU FINAL FILTERS

| Grid size | FFU dimensions (mm) |      |     | Ceiling-change dimensions (mm) |      |    | Room-side dimensions (mm) |      |     |                        |      |    |
|-----------|---------------------|------|-----|--------------------------------|------|----|---------------------------|------|-----|------------------------|------|----|
|           |                     |      |     | Nanoclass Square EF KE         |      |    | Adaptor frame             |      |     | Nanoclass Square EF TC |      |    |
|           | W                   | H    | D   | W                              | H    | D  | W                         | H    | D   | W                      | H    | D  |
| 1212      | 1162                | 1162 | 350 | 1170                           | 1170 | 86 | 1170                      | 1170 | 109 | 1135                   | 1135 | 80 |
|           | 1132                | 1132 | 350 | 1140                           | 1140 | 86 | 1140                      | 1140 | 109 | 1105                   | 1105 | 80 |
| 0912      | 862                 | 1162 | 350 | 870                            | 1170 | 86 | 870                       | 1170 | 109 | 835                    | 1135 | 80 |
|           | 832                 | 1132 | 350 | 840                            | 1140 | 86 | 840                       | 1140 | 109 | 805                    | 1105 | 80 |
| 0909      | 862                 | 862  | 350 | 870                            | 870  | 86 | 870                       | 870  | 109 | 835                    | 835  | 80 |
|           | 832                 | 832  | 350 | 840                            | 840  | 86 | 840                       | 840  | 109 | 805                    | 805  | 80 |
| 0612      | 562                 | 1162 | 350 | 570                            | 1170 | 86 | 570                       | 1170 | 109 | 535                    | 1135 | 80 |
|           | 532                 | 1132 | 350 | 540                            | 1140 | 86 | 540                       | 1140 | 109 | 505                    | 1105 | 80 |
| 0609      | 562                 | 862  | 350 | 570                            | 870  | 86 | 570                       | 870  | 109 | 535                    | 835  | 80 |
|           | 532                 | 832  | 350 | 540                            | 840  | 86 | 540                       | 840  | 109 | 505                    | 805  | 80 |
| 0606      | 562                 | 562  | 350 | 570                            | 570  | 86 | 570                       | 570  | 109 | 535                    | 535  | 80 |
|           | 532                 | 532  | 350 | 540                            | 540  | 86 | 540                       | 540  | 109 | 505                    | 505  | 80 |

## NANOCCLASS FFU PREFILTERS

| Grid size | FFU dimensions (mm) |      |     | Prefilter dimensions (mm) |     |    |               |     |    |                      |     |     |
|-----------|---------------------|------|-----|---------------------------|-----|----|---------------|-----|----|----------------------|-----|-----|
|           |                     |      |     | Airpanel Select FZL       |     |    | Airpanel EF S |     |    | Carboactiv Panel FFU |     |     |
|           | W                   | H    | D   | W                         | H   | D  | W             | H   | D  | W                    | H   | D   |
| 1212      | 1162                | 1162 | 350 | 740                       | 740 | 46 | 740           | 740 | 48 | 740                  | 740 | 165 |
|           | 1132                | 1132 | 350 |                           |     |    |               |     |    |                      |     |     |
| 0912      | 862                 | 1162 | 350 | 740                       | 740 | 46 | 740           | 740 | 48 | 740                  | 740 | 165 |
|           | 832                 | 1132 | 350 |                           |     |    |               |     |    |                      |     |     |
| 0909      | 862                 | 862  | 350 | 490                       | 490 | 46 | 490           | 490 | 48 | 490                  | 490 | 165 |
|           | 832                 | 832  | 350 |                           |     |    |               |     |    |                      |     |     |
| 0612      | 562                 | 1162 | 350 | 490                       | 490 | 46 | 490           | 490 | 48 | 490                  | 490 | 165 |
|           | 532                 | 1132 | 350 |                           |     |    |               |     |    |                      |     |     |
| 0609      | 562                 | 862  | 350 | 490                       | 490 | 46 | 490           | 490 | 48 | 490                  | 490 | 165 |
|           | 532                 | 832  | 350 |                           |     |    |               |     |    |                      |     |     |
| 0606      | 562                 | 562  | 350 | 370                       | 440 | 46 | 370           | 440 | 48 | 370                  | 440 | 165 |
|           | 532                 | 532  | 350 |                           |     |    |               |     |    |                      |     |     |

# Control for any installation

A central control unit enables simple yet precise management of your Nanoclass FFU system—whether you have one or several hundred units.



## ACF300

- Maximum of 250 FFUs organized in eight groups
- Facility, group and individual operational modes
- Standby clock-calendar
- Six digital inputs and six digital outputs
- Four password-protected user modes
- Two analog inputs for pressure, temperature, humidity, or air flow sensors
- Ethernet interface
- Remote control from PC or mobile phone
- Remote access to logged sensor data
- BMS interface via Modbus TCP



## ACC8

- Display graphics customized for each application
- Controls/monitors FFUs, sensors, actuators, and remote (room) displays
- Four levels of hierarchial control:
  - Overall facility
  - Rooms / groups
  - Workgroups (eg, workbenches, laminar flow stations)
  - Individual nodes (FFUs, sensors, actuators and remote displays)

# The filtration experts MANN+HUMMEL

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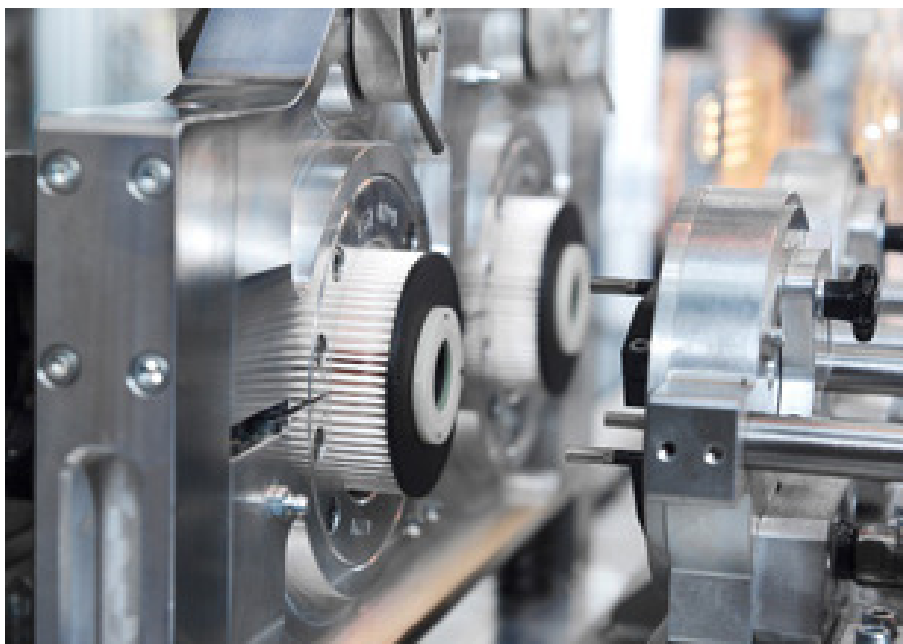
## TWENTY SIX

With every second that ticks by, another 26 filters roll off the MANN+HUMMEL production lines. And that is part of what makes us a world leader in filtration.

But it is our commitment to quality and innovation too. Of the 22,000 people we employ worldwide, over 1,000 work in our R&D department.

That means we are at the front when it comes to finding new ways to improve air quality or deliver it more efficiently – which can be seen in the more than 3,000 patents that we have registered.

And when it comes to delivering excellent service, we are always close at hand, with more than 80 locations across the world.



MANN+HUMMEL has been a filtration specialist for more than 80 years. Leadership in Filtration is what drives us.



## THE CLEANROOM SPECIALISTS

From an air filtration perspective, the most challenging contaminants to capture are those that are microscopic in size, but also present a risk to human health, expensive equipment or sensitive products. That's because both the difficulty and the risk of failure are high.

For more than 60 years, our filters have been in service in cleanrooms around the world – protecting people, processes and the wider environment from some of the most dangerous viruses, substances and other contaminants known to man. We've used this expertise to develop a range of filter fan units that you can count on to deliver the protection and performance that you need.



# Cleanroom classes

## CLEAN ZONE FLEXIBILITY

ISO 14644-1 is the international standard for classifying air cleanliness in cleanrooms and controlled environments. As each Nanoclass FFU can be controlled individually or as part of an overall system, it is possible to configure different zones within a cleanroom of different ISO classes—enabling greater production and operational flexibility.

| Class EN<br>ISO 14644-1 | Max. Allowed Concentrations (µm/m³) |            |           | GMP Class | Hibernation | Operation |
|-------------------------|-------------------------------------|------------|-----------|-----------|-------------|-----------|
|                         | 0.1 µm                              | 0.5 µm     | 1 µm      |           | 0.5 µm      | 5 µm      |
| 1                       | 10                                  |            |           | A         | 3,520       | 3,520     |
| 2                       | 100                                 |            |           | B         | 35,200      | 352,000   |
| 3                       | 1,000                               | 35         |           | C         | 352,000     | 3,500,000 |
| 4                       | 10,000                              | 352        | 83        | D         | 3,520,000   | N/A       |
| 5                       | 100,000                             | 3,520      | 832       |           |             |           |
| 6                       | 1,000,000                           | 35,200     | 8,320     |           |             |           |
| 7                       |                                     | 352,000    | 83,200    |           |             |           |
| 8                       |                                     | 3,520,000  | 832,000   |           |             |           |
| 9                       |                                     | 35,520,000 | 8,320,000 |           |             |           |

## CLEANROOM CLASSES IN DIFFERENT INDUSTRIES

| 1   | 2 | 3                | 4               | 5          | 6 | 7 | 8 | 9 |
|-----|---|------------------|-----------------|------------|---|---|---|---|
| R&D |   | Microelectronics |                 |            |   |   |   |   |
|     |   |                  | Chemicals       |            |   |   |   |   |
|     |   | Pharmaceuticals  |                 |            |   |   |   |   |
|     |   |                  | Optronics       |            |   |   |   |   |
|     |   |                  | Food & beverage |            |   |   |   |   |
|     |   |                  |                 | Aerospace  |   |   |   |   |
|     |   |                  |                 | Automotive |   |   |   |   |



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Leadership in Filtration

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