Fan Filter Units
The most advanced customized solutions for clean room technology – designed and produced from a single supplier.
Nicotra Gebhardt has defined their core competences:
- Aerodynamics
- Acoustics
- Electrical motors
- Control systems

Filter Fan Units made by Nicotra Gebhardt are available:
- as standard or customised versions
- for standard and customised ceiling grids
- for different filter and grid sizes
- as top load or bottom load versions
- for liquid or gasket seal systems
- for various air flows and pressure drops
- with minimal vibration and audible noise emissions
- with an external rotor motor system
- speed variation via BUS or supply voltage
- for various control systems

**Brushless DC - version**
- Internet/Intranet access for controlling, monitoring and visualising
- easy to install and set up with automatically addressed motor electronics
- built-in power factor controller (PFC) for reactive current compensation
- integrated self diagnosis and status messages
- high operational reliability as the impeller runs on latest command after power drop or loss

Why should FFU’s be used in cleanrooms?
Benefits which count …

... Redundancy
With hundreds, or thousands of individual FFU’s in a facility, the loss of one or more units does not jeopardise the integrity of the room.

... Flexibility
As the needs or uses change in a facility, the units can be exchanged with lay-in lights or blank panels. For facilities with lower classification, upgrades can be obtained by simply adding additional FFU’s. When a computer controlled management system is installed, units or clusters of units can be remote controlled to operational needs.

... Cost effective
Use motors with the lowest power consumption available. With complete controllability of each and every FFU (via control and monitoring software) use just as much of power as necessary for your process.

... Negative plenum
The negative plenum design draws recirculation air from the plenum itself. If there are any leaks, they migrate to the negative plenum and NOT the cleanroom.

... Salvageability
FFU’s are fully salvageable as stand alone units.
Filter Fan Units are key elements in clean room ventilation systems. Nicotra Gebhardt supplies the elements for Filter Fan Units (FFU) as well as the units themselves. Starting from standard FFU design, our team of experts implements the specification for your special project.

To guarantee a Running System join the power of your Convergence Company.

Nicotra Gebhardt’s aerodynamics research laboratories have brought forth over 50 years of experience in leading-edge fan design and highly efficient technology.

Since the very beginning of the Nicotra Gebhardt company the external rotor motor has been an essential element for driving fans. Nicotra Gebhardt has a manufacturing facility for production of external rotor motors – the conventional asynchronous version and the electronically controlled brushless DC design. An expert team with special laboratories and test rigs is pushing this development to new frontiers.
What are the exact dimensions required for your ideal FFU design?

Filter Fan Units (FFU) made by Nicotra Gebhardt with their perfectly matched components are designed for various kinds of industrial areas requiring clean room technology.

1. Dimensions of ceiling grid: (length, width, height in mm)

   ceiling grid: l: w: h:

   clearance between ceiling grid: l1: w1:

   mounting clearance: l2: w2:

   T-bar l3: w3:

   h:

2. Filter adaptations:

   sealing method: dry fluid

3. Casing:

   material:

   aluminium galvanised sheet metal (GI 90)

   zinc coated (AZ 150-300G)

   stainless steel (SUS 430)

   aluminium (Al Mg3 W19)

   fittings:

   pre-filter connector

   grid connector

   protection grid

   structured to support body weight

4. Requirements for installation/maintenance:

   FFU installation: clean room side plenum side

   filter replacement: clean room side plenum side

   motor replacement: clean room side plenum side

   Brushless DC control unit replacement: clean room side plenum side

Fans, motors and control units may be of Nicotra Gebhardt standard design or they may be specially adapted to the actual requirements of a project.
A system of standard sizes makes it possible – by combining them in different ways – to fill in every special shape of a building and, in this way, to create a filter fan ceiling, actively covered by the most effective filter fan units.

**Main dimensions of the standard sizes**

<table>
<thead>
<tr>
<th>nominal grid sizes</th>
<th>example ( W_c ) [mm]</th>
<th>example ( L_c ) [mm]</th>
<th>minimum ( H_f ) [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFU 1200 x 1200</td>
<td>4’ x 4’</td>
<td>1172</td>
<td>1172</td>
</tr>
<tr>
<td>FFU 900 x 1200</td>
<td>3’ x 4’</td>
<td>872</td>
<td>1172</td>
</tr>
<tr>
<td>FFU 600 x 1200</td>
<td>2’ x 4’</td>
<td>572</td>
<td>1172</td>
</tr>
<tr>
<td>FFU 750 x 1500</td>
<td>2.5’ x 5’</td>
<td>720</td>
<td>1470</td>
</tr>
<tr>
<td>FFU 600 x 600</td>
<td>2’ x 2’</td>
<td>534</td>
<td>534</td>
</tr>
</tbody>
</table>

Other dimensions to customer’s requirements

Using standard sizes to adapt for special building requirements
## What flowrate/air velocity do you need?

What are your noise criteria?

Nicotra Gebhardt offers software and hardware especially developed to match the high demands for a perfect clean room system.

Any required flow of air can be achieved by adjusting the fan size or its rotating speed. Uneven air flow distribution can be caused by a poorly designed ventilation system or by the uneven flow of air through the filter.

### 5. Aerodynamics

<table>
<thead>
<tr>
<th>Duty point nominal</th>
<th>air</th>
</tr>
</thead>
<tbody>
<tr>
<td>volume (/m³/h) flowrate:</td>
<td>velocity (m/s)</td>
</tr>
<tr>
<td>external static pressure: (Pa) total pressure: (Pa)</td>
<td></td>
</tr>
<tr>
<td>filter losses: (Pa)</td>
<td></td>
</tr>
</tbody>
</table>

### 6. Audible noise (single unit)

<table>
<thead>
<tr>
<th>Sound power level</th>
<th>dB (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound pressure level (measured at 1.5 m below filter)</td>
<td>dB (A) NC criteria: NC value</td>
</tr>
</tbody>
</table>

### Vibration Results

Transducer: example: vibration less than 2 mm/s

![Vibration frequency chart](image)
The demands of air flow uniformity are magnified with the increased requirements of higher room cleanliness classifications and more end users are specifying reduced variation of velocity profiles.

**Low noise**

High efficiency includes low noise levels. Special sound measuring facilities make it possible to detect every peak in frequency bands and to improve a spectrum by designing new noise patterns.

Fan testing in accordance with ISO 5801 chamber to measure volumetric air flow, pressure difference and power consumption.

Noise measurement chamber class 2
DIN 45635

**FFU longterm study**

Air distribution measurement

- 0.40 - 0.45 m/s
- 0.45 - 0.50 m/s
- 0.50 - 0.55 m/s
- 0.55 - 0.60 m/s
- 0.60 - 0.65 m/s

Air velocity with the filter in 36 square sections of same size below the filter. No measurement point exceeded 30%. More than 80% have been less than ±20% deviation.
What about the power supply?

Asynchronous motor

This type of motor permits a speed control by simple voltage variation.

7. Electrical requirements / power supply

7.1 Asynchronous

voltage:

- VAC 1-phase
- VAC 3-phases

frequency:

Hz

motor protection:

PTC / Therm. Contact

Comparison of efficiency
AC - Brushless DC - unit with a power rating $P_n= 200 \text{ W}$

Asynchronous motor

- Established and proven technology
- Not affected by external radio interference
- Individual speed easily and directly adjustable with voltage control unit
- Various possibilities (options) for control:
  - Voltage control unit
  - Single phase AC converter
  - Single phase or 3-phases power supply
Asynchronous motors

This allows the motor to operate more efficiently and therefore the motor size can be slightly smaller than that of a standard IEC motor.

Nicotra Gebhardt motors comply with EN 60034-1 according to thermal class B resp. F. Motors for UL-FFUs in accordance with UL 1004 resp. UL 2111, thermal class A.

High-voltage test rig

Automatic winding-machine
What about the electronics?

**Brushless DC motor**
(Brushless DC motor)

- Outstanding efficiency because of permanent magnets
- High torque over a wide speed range
- High power factor (> 0.9)
- Low harmonic distortion of power supply current through PFC
- Compact control device

A drive unit consisting of an electronically commutated motor differs from the former DC motors as there are no collector or carbon brushes.

These wearing components have been replaced in an electronic commutated motor with maintenance-free electronics (control unit).

### 7.2 Brushless DC

**voltage:**
- VAC 1-phase

**frequency:**
- Hz

**motor protection:**
- electronically monitored
This is how it works:

The Brushless DC motor has three winding circuits, which are controlled by the electronic commutation unit with a changing current impulse.

The electric current results in a magnetic field which interacts with the field of the permanent magnets of the rotor. This generates a torque for the motor.

To create a continuous rotating movement of the rotor, the electric current must now be switched relative to the position of the rotating permanent magnet rotor field.

The position of the permanent magnet is detected by hall effect sensors and as a result of this signal the control electronics carry out the commutation.
Monitoring and Controlling

The keypoint of the clean room is the FFU, which can be selected in different performance / efficiency / configuration and used in different places in the process or ventilating system.

8. Controls

| adjustable | adjustable |
| group | group |

(analogue) voltage converter network (digital) computer controlled

frequency converter

phase loop controller

Network Topology:
The Nicotra Gebhardt FFU Monitoring and Control System consists of a FFU control network connected to a computerised FFU Control centre. This FFU System is especially made for the high demands of clean room applications.

The FFU Control centre allows control of a large quantity of FFUs in a very flexible and future oriented way.

At the heart of the system is a control centre (server) which contains network management, process control and web server as main parts.

Several clients, running under a conventional Internet browser like Microsoft™ Internet Explorer™ serve as visualisation and operating console (user interface).

An optional implementation and setup tool is available as well as an OPC access.

These figures give an overview of the Nicotra Gebhardt FFU Monitoring and Control System.
Topology Overview

This Figure shows the complete FFU G BUS control network topology as recommended by Nicotra Gebhardt. The field bus section uses G BUS technology in ring topology for the Ethernet part and line topology for the RS485 part.

The G BUS is structured with gateways with a redundant Ethernet backbone and several FFU lines. Additional I/O modules for connection to the server are also available. The FFU Server can be provided with a redundancy server in hot-standby configuration.
Benefits of the communication systems

**G BUS**
- Low system cost
- Easy and fast commissioning at jobsite
- Fast multiple command response
- Fast multiple error response
- Complete project engineering and programming at design phase
- Low effort for components change

**LONWORKS®**
- Fast single command response
- Fast single error response
- FFU calibration from cleanroom
- Handheld service tool
- Free network topology
- Digital input modules available
- Temperature sensors available
- Extensible system

**Modbus RTU**
- Easy integration into a customers network through standardised interface possible

**Analogue**
- Analogue interface available for using without network system (0-5 V, 0-10 V, n_min, n_max, error contact)

**Software & controlling**
- Ethernet, IP network, HTTP protocol, HTML/XML, Internet Browsers (Microsoft® Internet Explorer®)
- Registration of each FFU run time for preventive filter maintenance
- Remote maintenance and configuration via Internet connection
- Freely programmable time scheduler for automated FFU control (speed-up or speed-down of single FFUs or groups)
- Event logging (status- and change logfile)
## Compare one system to the other

<table>
<thead>
<tr>
<th></th>
<th>LONWORKS®</th>
<th>G BUS</th>
<th>Modbus RTU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FFU Server PC</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>User client local or remote via Ethernet</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Multiple clients</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Network topology</td>
<td>Free Topology</td>
<td>Line Topology</td>
<td>Line Topology</td>
</tr>
<tr>
<td>Backbone</td>
<td>FTT-10A</td>
<td>Ethernet</td>
<td>Modbus RTU</td>
</tr>
<tr>
<td>Field Bus</td>
<td>FTT-10A</td>
<td>RS485</td>
<td>RS485</td>
</tr>
<tr>
<td>Physical Repeater/Ethernet Gateway</td>
<td>2 or 3 way¹</td>
<td>5 lines²</td>
<td>–</td>
</tr>
<tr>
<td>Nodes per Segment</td>
<td>60</td>
<td>100</td>
<td>247</td>
</tr>
<tr>
<td>Maximum number of FFUs at the network</td>
<td>32,000</td>
<td>127,000</td>
<td>–</td>
</tr>
<tr>
<td>Network Terminator</td>
<td>+</td>
<td>not needed</td>
<td>not needed</td>
</tr>
<tr>
<td>8 Digital Input Module</td>
<td>+</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Digital I/O Station</td>
<td>+</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Temperature Sensor Module</td>
<td>+</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Handheld Service Tool</td>
<td>+</td>
<td>not needed</td>
<td>–</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication Principle</td>
<td>Multi-Master</td>
<td>Master-Slave</td>
<td>Master-Slave</td>
</tr>
<tr>
<td>Heartbeat (Send-On-Change)</td>
<td>+²</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Polling</td>
<td>+⁴</td>
<td>+⁵</td>
<td>+</td>
</tr>
<tr>
<td>Addressing</td>
<td>Neuron-ID⁶</td>
<td>Hardware⁷</td>
<td>Hardware</td>
</tr>
<tr>
<td><strong>Server Software</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Import FFUs²</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>FFUs organized in building structures</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Free definable FFU groups</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>2 control modes (% of Maxspeed, Air Speed)</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Integrated scheduler⁸</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>3 different FFU error priorities</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>FFU runtime counter</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Digital input event handler</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Handling of temperature sensors</td>
<td>+</td>
<td>–</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Global emergency input¹⁰</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Printing of error messages</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>eMailing, Paging, SMS¹¹</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Log files (Error, Change, Speed Logs)</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>OPC Server¹²</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td><strong>User Interface (Client)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User management with graduated authorisation¹³</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Optimized for MICROSOFT® Internet Explorer®</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Colours and operator rights customizable</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Background drawing for each structure element</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Project navigation tree</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Alarm sound customizable</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
<tr>
<td>Help function</td>
<td>+</td>
<td>+</td>
<td>provided by the customer</td>
</tr>
</tbody>
</table>

¹ can drive 1 or 2 segments with 60 nodes each  
² can drive 5 lines with 100 nodes each  
³ in case of error, speed change and time-out  
⁴ only if no heartbeat could be received by the server  
⁵ parallel polling of max. 500 FFUs by each gateway  
⁶ subnet/node addressing after FFU installation  
⁷ node address set by hardware switch  
⁸ from MICROSOFT® EXCEL® *.csv format  
⁹ weekly programmable (start, stop, set speed)  
¹⁰ one dry contact, configurable functions: "Shutdown All FFUs" or "Display Only"  
¹¹ external service provider required  
¹² optional  
¹³ "Viewer", "Operator", "Administrator" as soon as self provided user profiles
The FANCommander 200 is a stand-alone monitoring and control unit for up to 200 fans. Fans can be controlled and monitored individually or by groups.

The device offers easy commissioning and operating assisted by a clear menu structure and the single control element. Additional features like an automatic day/night shift (controlled by external input or by included clock), 3-level operator rights and non-volatile error storage downloadable to a PC make the FANCommander 200 a smart monitoring and control solution for small fan systems.

**Properties**

- Fan control and parametrization
  - Single, groups, line, total of up to 200 fans
  - GBus-Fan address 0...99 at 2 lines → 200 Fans

- Addressing
  - lighted LCD: 4 lines, 20 characters

- Display
  - One element (turn and push button)

- Control elements
  - Menu controlled

- Operation and navigation
  - Day speed
  - Night speed
  - ON/OFF
  - Maximum speed
  - Restart delay
  - Wink function
  - Reset errors

- Fan parameter control
  - non-volatile error storage
  - download error storage to PC (serial interface)
  - separate error indication of:
    - present errors
    - new (unconfirmed) errors
  - error indication by:
    - Display
    - LED
    - dry contact output

- Automatic day/night shift
  - external control (24V DC input)
  - internal control (clock controlled)

- Additional features
  - Internal clock
  - automatic fan registration (scan function)
  - UL-Listed (UL 508C)

- Supply voltage
  - 115/230V AC
This makes the FFU system (Brushless DC motors) offered by Nicotra Gebhardt so attractive:

- Only 1 person for implementing or maintenance needed
- Client and server run at one PC or at two separated PCs connected via Ethernet link
- Any desired number of FFUs can be handled

- Graduated authorisation levels ("view only", "operate" or "administration")
- Freely definable FFU groups (structural and logical groups)
- OPC option for master station access (Wonderware™, Inтел-юш™ or other OPC capable clients)

Summary of the fan curves

<table>
<thead>
<tr>
<th>Type name</th>
<th>Supply voltage</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHA 1212-240-6D01-A</td>
<td>AC, 3ph, 50 Hz</td>
<td>Page 18</td>
</tr>
<tr>
<td>RHP 1212-240-EC00-A</td>
<td>BLDC, 1ph, 50/60 Hz</td>
<td>Page 19</td>
</tr>
<tr>
<td>RHA 0912-335-4D00-A</td>
<td>AC, 3ph, 50 Hz</td>
<td>Page 20</td>
</tr>
<tr>
<td>RHP 0912-231-EC01-A</td>
<td>BLDC, 1ph, 50/60 Hz</td>
<td>Page 21</td>
</tr>
<tr>
<td>RHA 0612-331-4D00-A</td>
<td>AC, 3ph, 50 Hz</td>
<td>Page 22</td>
</tr>
<tr>
<td>RHP 0612-331-EC04-A</td>
<td>BLDC, 1ph, 50/60 Hz</td>
<td>Page 23</td>
</tr>
<tr>
<td>RHA 1212-240-6E12-BAS</td>
<td>AC, 1ph, 50 Hz</td>
<td>Page 24</td>
</tr>
<tr>
<td>RHA 1212-240-6E42-BAS</td>
<td>AC, 1ph, 60 Hz</td>
<td>Page 25</td>
</tr>
<tr>
<td>RHA 0912-231-4E11-BAS</td>
<td>AC, 1ph, 50 Hz</td>
<td>Page 26</td>
</tr>
<tr>
<td>RHA 0912-231-6E41-BAS</td>
<td>AC, 1ph, 60 Hz</td>
<td>Page 27</td>
</tr>
<tr>
<td>RHA 0612-331-4E11-BAS</td>
<td>AC, 1ph, 50 Hz</td>
<td>Page 28</td>
</tr>
<tr>
<td>RHA 0612-331-6E41-BAS</td>
<td>AC, 1ph, 60 Hz</td>
<td>Page 29</td>
</tr>
<tr>
<td>RHA 1212-240-6DB4-A</td>
<td>AC, 3ph, 60 Hz</td>
<td>Page 30</td>
</tr>
<tr>
<td>RHA 1212-240-6E45-BAS</td>
<td>AC, 1ph, 60 Hz,</td>
<td>Page 31</td>
</tr>
<tr>
<td>RHA 0912-231-6DB3-A</td>
<td>AC, 3ph, 60 Hz</td>
<td>Page 32</td>
</tr>
<tr>
<td>RHA 0912-231-6E43-BAS</td>
<td>AC, 1ph, 60 Hz,</td>
<td>Page 33</td>
</tr>
<tr>
<td>RHA 0612-331-4DB4-A</td>
<td>AC, 3ph, 60 Hz,</td>
<td>Page 34</td>
</tr>
<tr>
<td>RHA 0612-231-6E43-BAS</td>
<td>AC, 1ph, 60 Hz,</td>
<td>Page 35</td>
</tr>
</tbody>
</table>
Filter Fan Units
RHA 1212-240-6D01-A

Air density \( \rho = 1.15 \text{ kg/m}^3 \)

Data for duty point:
- Air velocity \( v \): 0.35 m/s \( (q_v = 1815 \text{ m}^3/\text{h}) \)
- Fan static pressure \( p_{sf} \): 170 Pa (unit without filter, with inlet guard)
- Voltage \( U \): 251 V
- Speed \( N \): 846 1/min (on request)
- Input Power \( P_e \): 215 W
- Current \( I \): 0.63 A (on request)
- Sound pressure level \( L_{pA1.5} \): 47 dB (with filter, A-weighted)
- Sound pressure levels at octave frequencies (on request)
  - Octave frequency: 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz
  - Sound pressure level: 64, 54, 47, 45, 43, 34, 25, 18 dB

Fan Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan type</td>
<td>RLA 21-0400-6D-S</td>
</tr>
<tr>
<td>Motor type</td>
<td>MFA F0-1112-6D-K3-00</td>
</tr>
<tr>
<td>Voltage ( U )</td>
<td>400 V ( Y ), 3~</td>
</tr>
<tr>
<td>Frequency ( f )</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Max. input power ( P_{e,\text{max}} )</td>
<td>0.29 kW</td>
</tr>
<tr>
<td>Max. current ( I_{\text{max}} )</td>
<td>0.85 A</td>
</tr>
<tr>
<td>Speed ( N )</td>
<td>940 1/min</td>
</tr>
<tr>
<td>Fan weight (steel) ( m )</td>
<td>55 kg (without filter)</td>
</tr>
<tr>
<td>Fan weight (aluminium) ( m )</td>
<td>38 kg (without filter)</td>
</tr>
<tr>
<td>Input power ( P_e )</td>
<td>215 W</td>
</tr>
<tr>
<td>A-weighted sound pressure level ( L_{pA1.5} )</td>
<td>47 dB</td>
</tr>
<tr>
<td>A-weighted sound power level ( L_{WA} )</td>
<td>10 dB</td>
</tr>
</tbody>
</table>
**Air density** = 1.15 kg/m³

**Data for duty point:**

- **Air velocity** $v = 0.35$ m/s ($q_v = 1815$ m³/h)
- **Fan static pressure** $p_{sf} = 170$ Pa (unit without filter, with inlet guard)
- **Speed** $N = 847$ 1/min (on request)
- **Input Power** $P_e = 173$ W
- **Current** $I = 0.78$ A (on request)
- **Sound pressure level** $L_{PA1.5} = 48$ dB (with filter, A-weighted)
- **Sound pressure levels at octave frequencies** (on request)
  - Octave frequency: 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz
  - Sound pressure level: 65, 54, 46, 45, 44, 38, 29, 22 dB

**Sound pressure levels**

<table>
<thead>
<tr>
<th>Octave frequency (Hz)</th>
<th>Sound pressure level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>65</td>
</tr>
<tr>
<td>125</td>
<td>54</td>
</tr>
<tr>
<td>250</td>
<td>46</td>
</tr>
<tr>
<td>500</td>
<td>45</td>
</tr>
<tr>
<td>1000</td>
<td>44</td>
</tr>
<tr>
<td>2000</td>
<td>38</td>
</tr>
<tr>
<td>4000</td>
<td>29</td>
</tr>
<tr>
<td>8000</td>
<td>22</td>
</tr>
</tbody>
</table>

**Unweighted sound pressure levels**

<table>
<thead>
<tr>
<th>Octave frequency (Hz)</th>
<th>Sound pressure level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>65</td>
</tr>
<tr>
<td>125</td>
<td>54</td>
</tr>
<tr>
<td>250</td>
<td>46</td>
</tr>
<tr>
<td>500</td>
<td>45</td>
</tr>
<tr>
<td>1000</td>
<td>44</td>
</tr>
<tr>
<td>2000</td>
<td>38</td>
</tr>
<tr>
<td>4000</td>
<td>29</td>
</tr>
<tr>
<td>8000</td>
<td>22</td>
</tr>
</tbody>
</table>

**Sound pressure level at 1.5m distance (mid filter)** $L_{PA1.5} = 48$ dB

**Max. speed** $N_{max} = 1070$ 1/min

**Fan Data**

- **Fan type**: RLP 21-0400-EC
- **Motor type**: MFA FP-0817-EC-K0-02

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed, N</td>
<td>847 1/min</td>
</tr>
<tr>
<td>Input power, $P_e$</td>
<td>173 W</td>
</tr>
<tr>
<td>A-weighted sound pressure level at 1.5m distance (mid filter), $L_{A1.5}$</td>
<td>48 dB</td>
</tr>
<tr>
<td>A-weighted sound power level = $L_{A1.5} + 10$ dB</td>
<td>58 dB</td>
</tr>
<tr>
<td>A-weighted sound pressure level at 1.5m distance (mid filter)**</td>
<td>48 dB</td>
</tr>
<tr>
<td>Max. input power, $P_{e,max}$</td>
<td>0.37 kW</td>
</tr>
<tr>
<td>Max. current, $I_{max}$</td>
<td>1.62 A</td>
</tr>
<tr>
<td>Max. speed, $N_{max}$</td>
<td>1070 1/min</td>
</tr>
</tbody>
</table>

**UL-proofed pivot:**

**Motor**

Brushless
DC motor
1ph, 50/60 Hz

**Motor type**

MFA FP-0817-EC-K0-02

**Voltage** $U = 230$ V, 1~

**Frequency** $f = 50$ Hz

**Max. input power** $P_{e,max} = 0.37$ kW

**Max. current** $I_{max} = 1.62$ A

**Max. speed** $N_{max} = 1070$ 1/min

**Fan Data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed, N</td>
<td>847 1/min</td>
</tr>
<tr>
<td>Input power, $P_e$</td>
<td>173 W</td>
</tr>
<tr>
<td>A-weighted sound pressure level at 1.5m distance (mid filter), $L_{A1.5}$</td>
<td>48 dB</td>
</tr>
<tr>
<td>A-weighted sound power level = $L_{A1.5} + 10$ dB</td>
<td>58 dB</td>
</tr>
<tr>
<td>A-weighted sound pressure level at 1.5m distance (mid filter)**</td>
<td>48 dB</td>
</tr>
<tr>
<td>Max. input power, $P_{e,max}$</td>
<td>0.37 kW</td>
</tr>
<tr>
<td>Max. current, $I_{max}$</td>
<td>1.62 A</td>
</tr>
<tr>
<td>Max. speed, $N_{max}$</td>
<td>1070 1/min</td>
</tr>
</tbody>
</table>

**Fan Data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed, N</td>
<td>847 1/min</td>
</tr>
<tr>
<td>Input power, $P_e$</td>
<td>173 W</td>
</tr>
<tr>
<td>A-weighted sound pressure level at 1.5m distance (mid filter), $L_{A1.5}$</td>
<td>48 dB</td>
</tr>
<tr>
<td>A-weighted sound power level = $L_{A1.5} + 10$ dB</td>
<td>58 dB</td>
</tr>
<tr>
<td>A-weighted sound pressure level at 1.5m distance (mid filter)**</td>
<td>48 dB</td>
</tr>
<tr>
<td>Max. input power, $P_{e,max}$</td>
<td>0.37 kW</td>
</tr>
<tr>
<td>Max. current, $I_{max}$</td>
<td>1.62 A</td>
</tr>
<tr>
<td>Max. speed, $N_{max}$</td>
<td>1070 1/min</td>
</tr>
</tbody>
</table>
**Filter Fan Units**

**RHA 0912-335-4D00-A**

Air density = 1.15 kg/m³

---

**Data for duty point:**

- Air velocity $v$: 0.35 m/s ($qv = 1360 \text{ m}^3/\text{h}$)
- Fan static pressure $p_{sf}$: 170 Pa (unit without filter, with inlet guard)
- Voltage $U$: 217 V
- Speed $N$: 1126 1/min (on request)
- Input Power $P_a$: 218 W
- Current $I$: 0.71 A (on request)
- Sound pressure level $L_{pA1.5}$: 52 dB (with filter, A-weighted)
- Sound pressure levels at octave frequencies (on request)
- Octave frequency: 63 125 250 500 1000 2000 4000 8000 Hz
- Sound pressure level unweighted: 63 60 51 49 45 43 33 22 dB

---

**Fan Data**

<table>
<thead>
<tr>
<th>Fan type</th>
<th>RLA 31-3135-4D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor type</td>
<td>MFA F0-0911-4D-K3-00</td>
</tr>
<tr>
<td>$U$ Voltage</td>
<td>V</td>
</tr>
<tr>
<td>$P_a$ Input power</td>
<td>W</td>
</tr>
<tr>
<td>$L_{pA1.5}$ A-weighted sound pressure level at 1.5m distance (mid filter) dB</td>
<td>dB</td>
</tr>
<tr>
<td>$L_{pA10}$ A-weighted sound power level</td>
<td>dB</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Fan weight (steel) $m$</th>
<th>49 kg (without filter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan weight (aluminium) $m$</td>
<td>35 kg (without filter)</td>
</tr>
<tr>
<td>Voltage $U$</td>
<td>400 V (Y), 3~</td>
</tr>
<tr>
<td>Frequency $f$</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Max. inputpower $P_{in}$</td>
<td>0.33 kW</td>
</tr>
<tr>
<td>Max. current $I_{max}$</td>
<td>0.76 A</td>
</tr>
<tr>
<td>Speed $N$</td>
<td>1390 1/min</td>
</tr>
</tbody>
</table>
**Data for duty point:**
- Air velocity $v = 0.35$ m/s ($qv = 1360$ m³/h)
- Fan static pressure $p_{sf} = 170$ Pa (unit without filter, with inlet guard)
- Speed $N = 960$ 1/min (on request)
- Input Power $P_e = 128$ W
- Current $I = 0.59$ A (on request)
- Sound pressure level $L_{pA1.5} = 49$ dB (with filter, A-weighted)
- Sound pressure levels at octave frequencies (on request)
- Octave frequency 63 125 250 500 1000 2000 4000 8000 Hz
- Sound pressure level unweighted
  - 63: 57 dB
  - 125: 55 dB
  - 250: 53 dB
  - 500: 52 dB
  - 1000: 50 dB
  - 2000: 48 dB
  - 4000: 46 dB
  - 8000: 44 dB

**Fan Data**

<table>
<thead>
<tr>
<th>Fan type</th>
<th>RLP 21-0315-EC-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor type</td>
<td>MFA FP-0817-EC-K0-07</td>
</tr>
<tr>
<td>$N$</td>
<td>Speed 1/min</td>
</tr>
<tr>
<td>$P_e$</td>
<td>Input power W</td>
</tr>
<tr>
<td>$L_{pA1.5}$</td>
<td>A-weighted sound pressure level at 1.5m distance (mid filter) dB</td>
</tr>
<tr>
<td>$L_{wA6}$</td>
<td>A-weighted sound power level $= L_{pA1.5} + 10$ dB</td>
</tr>
</tbody>
</table>

**Notes:**
- Brushless DC motor
- 1ph, 50/60 Hz
- Filter Fan Units
- RHP 0912-231-EC01-A
- 900x1200 (3'x4')

**Fan Weight:**
- Steel: 49 kg (without filter)
- Aluminium: 35 kg (without filter)

**Voltage:**
- $U = 230$ V 1~

**Frequency:**
- $f = 50$ Hz

**Max. Input Power:**
- $P_{e, max} = 0.365$ kW

**Max. Current:**
- $I_{max} = 1.60$ A

**Max. Speed:**
- $N_{max} = 1350$ 1/min
Data for duty point:

- Air velocity $v$: 0.35 m/s ($q_v = 910$ m³/h)
- Fan static pressure $p_{SF}$: 170 Pa (unit without filter, with inlet guard)
- Voltage $U$: 268 V
- Speed $N$: 1240 1/min (on request)
- Input Power $P_e$: 128 W
- Current $I$: 0.35 A (on request)
- Sound pressure level $L_{pA1.5}$: 47 dB (with filter, A-weighted)
- Sound pressure levels at octave frequencies (on request)
  - Octave frequency: 63 125 250 500 1000 2000 4000 8000 Hz
  - Sound pressure level unweighted: 61 58 48 45 38 35 29 21 dB

Filter Fan Units

RHA 0612-331-4D00-A

600×1200 (2’×4’)

Asynchronous motor
3ph, 50 Hz

Fan Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>RLA 31-2831-4D</th>
<th>MFA FO-0810-4D-K3-01</th>
</tr>
</thead>
<tbody>
<tr>
<td>U Voltage</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$P_e$ Input power</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>$L_{pA1.5}$ A-weighted sound pressure level at 1.5m distance (mid filter)</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>$L_{pA2}$ A-weighted sound power level = $L_{pA1.5} + 10$ dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan weight (steel)</td>
<td>m</td>
<td>43 kg (without filter)</td>
</tr>
<tr>
<td>Fan weight (aluminium)</td>
<td>m</td>
<td>32 kg (without filter)</td>
</tr>
<tr>
<td>Voltage</td>
<td>V</td>
<td>400 V (Y), 3~</td>
</tr>
<tr>
<td>Frequency</td>
<td>f</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Max. input power</td>
<td>$P_{in,max}$</td>
<td>0.19 kW</td>
</tr>
<tr>
<td>Max. current</td>
<td>$I_{max}$</td>
<td>0.44 A</td>
</tr>
<tr>
<td>Speed</td>
<td>N</td>
<td>1340 1/min</td>
</tr>
</tbody>
</table>

Air density $= 1.15$ kg/m³
### Data for duty point:

- **Air velocity** \( v \) 0.35 m/s  
- **Fan static pressure** \( p_{f} \) 170 Pa  
- **Speed** \( N \) 1213 1/min  
- **Input Power** \( P_e \) 105 W  
- **Current** \( I \) 0.48 A  
- **Sound pressure level** \( L_{pA1.5} \) 47 dB  
- **Sound pressure levels at octave frequencies**:  
  - Octave frequency: 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz  
  - Sound pressure level unweighted: 60, 59, 46, 44, 37, 33, 25, 20 dB  

### Fan Data

- **Fan type**: RLP 31-2831-EC-S  
- **Motor type**: MFA FP-0817-EC-K0-08  
- **Fan weight (steel)** \( m \) 43 kg (without filter)  
- **Fan weight (aluminum)** \( m \) 32 kg (without filter)  
- **Voltage** \( U \) 230 V, 1~  
- **Frequency** \( f \) 50 Hz  
- **Max. input power** \( P_{e,\text{max}} \) 0.33 kW  
- **Max. current** \( I_{\text{max}} \) 1.45 A  
- **Max. Speed** \( N_{\text{max}} \) 1750 1/min  

---

### Additional Information

- **Air density**: 1.15 kg/m³  
- **Filter Fan Units**: RHP 0612-331-EC04-A  

---

**Note**: The diagram shows the relationship between various parameters such as air velocity, volume flowrate, and fan static pressure, with specific data points and ranges for performance metrics.
Filter Fan Units

RHA 1212-240-6E12-BAS

1200×1200 (4'×4')

Asynchronous motor
1ph, 50 Hz

Fan Data

<table>
<thead>
<tr>
<th>Fan type</th>
<th>RLA 21-0400-6E-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor type</td>
<td>MFA F0-1112-6E-K3-C0-S</td>
</tr>
<tr>
<td>Operating capacitor</td>
<td>8 µF</td>
</tr>
<tr>
<td>Voltage U</td>
<td>V</td>
</tr>
<tr>
<td>Input power P_e</td>
<td>W</td>
</tr>
<tr>
<td>A-weighted sound pressure level at 1.5m distance (mid filter) L_pA1.5</td>
<td>dB</td>
</tr>
<tr>
<td>A-weighted sound power level L_wA6</td>
<td>dB</td>
</tr>
<tr>
<td>Fan weight (steel) m</td>
<td>55 kg (without filter)</td>
</tr>
<tr>
<td>Fan weight (aluminium) m</td>
<td>38 kg (without filter)</td>
</tr>
<tr>
<td>Voltage U</td>
<td>220 V, 1~</td>
</tr>
<tr>
<td>Frequency f</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Max. inputpower P_{e,max}</td>
<td>0.32 kW</td>
</tr>
<tr>
<td>Max. current I_{max}</td>
<td>1.53 A</td>
</tr>
<tr>
<td>Speed N</td>
<td>940 1/min</td>
</tr>
</tbody>
</table>

Data for duty point:

- Air velocity $v$ = 0.35 m/s ($q_v = 1815$ m³/h)
- Fan static pressure $p_{sf}$ = 170 Pa (unit without filter, with inlet guard)
- Voltage $U$ = 154 V
- Speed $N$ = 845 1/min (on request)
- Input Power $P_e$ = 234 W
- Current $I$ = 1.56 A (on request)
- Sound pressure level $L_{pA1.5}$ = 53 dB (with filter, A-weighted)
- Sound pressure levels at octave frequencies on request
- Octave frequency 63 125 250 500 1000 2000 4000 8000 Hz
- Sound pressure level unweighted

- $P_e = 250$ W
- $L_{pA1.5} = 55$ dB
- $U = 220$ V
- $P_{e,max} = 0.32$ kW

Air density $= 1.15$ kg/m³
Data for duty point:

- Air velocity $v$: 0.35 m/s ($q_v = 1360$ m³/h)
- Fan static pressure $p_{sf}$: 170 Pa (unit without filter, with inlet guard)
- Voltage $U$: 193 V
- Speed $N$: 976 1/min (on request)
- Input Power $P_e$: 238 W
- Current $I$: 1.25 A (on request)
- Sound pressure level $L_{pA1.5}$: 52 dB (with filter, A-weighted)
- Sound pressure levels at octave frequencies (on request)
- Octave frequency: 63 125 250 500 1000 2000 4000 8000 Hz
- Sound pressure level unweighted: 58 56 50 50 46 44 33 25 dB

Fan Data

- Fan type: RLA 21-0315-4E-S
- Motor type: MFA F1-0911-4E-K3-C0-S
- Operating capacitor: 6 µF
- Voltage $U$: V
- Input power $P_e$: W
- $L_{pA1.5}$: A-weighted sound pressure level at 1.5m distance (mid filter) dB
- $L_{pA15+10}$: A-weighted sound power level $= L_{pA1.5} + 10$ dB
- Fan weight (steel): m 49 kg (without filter)
- Fan weight (aluminium): m 35 kg (without filter)
- Voltage $U$: 220 V, 1~
- Frequency $f$: 50 Hz
- Max. inputpower $P_{e,max}$: 0.30 kW
- Max. current $I_{max}$: 1.37 A
- Speed $N$: 1060 1/min
**Data for duty point:**

- **Air velocity** \( v \) = 0.35 m/s (\( q_v = 1360 \text{ m}^3/\text{h} \))
- **Fan static pressure** \( p_{SF} \) = 170 Pa (unit without filter, with inlet guard)
- **Voltage** \( U \) = 101 V
- **Speed** \( N \) = 986 1/min (on request)
- **Input Power** \( P_e \) = 195 W
- **Current** \( I \) = 2.0 A (on request)
- **Sound pressure level** \( L_{PA} \) = 51 dB (with filter, A-weighted)
- **Sound pressure levels at octave frequencies** (on request)
- **Octave frequency** = 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz
- **Sound pressure level** = 58, 55, 49, 49, 46, 43, 33, 24 dB
- **Voltage** \( U \) = 120 V, 1~
- **Frequency** \( f \) = 60 Hz
- **Max. inputpower** \( P_{e,\text{max}} \) = 0.24 kW
- **Max. current** \( I_{\text{max}} \) = 2.1 A
- **Speed** \( N \) = 1070 1/min

**Fan weight**

- \( m \) = 49 kg (without filter)
- \( m \) (aluminium) = 35 kg (without filter)

**Fan Data**

| Fan weight | m | 49 kg (without filter) |
| Motor type | MFA F0-0911-6E-K3-A0-S |
| Operating capacitor | 16 \( \mu \)F |
| Voltage | \( V \) |
| Input power | \( W \) |
| \( L_{PA} \) A-weighted sound pressure level at 1.5m distance (mid filter) dB |
| \( L_{PA} \) A-weighted sound power level = \( L_{PA} \) +10 dB |
| Max. inputpower | \( P_{e,\text{max}} \) = 0.24 kW |
| Max. current | \( I_{\text{max}} \) = 2.1 A |
| Speed | \( N \) = 1070 1/min |
Data for duty point:
- Air velocity $v = 0.35 \text{ m/s}$ ($q_v = 910 \text{ m}^3/\text{h}$)
- Fan static pressure $p_{sf} = 170 \text{ Pa}$ (unit without filter, with inlet guard)
- Voltage $U = 168 \text{ V}$
- Speed $N = 1237 \text{ 1/min (on request)}$
- Input Power $P_i = 141 \text{ W}$
- Current $I = 0.87 \text{ A}$ (on request)
- Sound pressure level $L_{pA1.5} = 51 \text{ dB}$ (with filter, A-weighted)
- Sound pressure levels at octave frequencies (on request)
- Octave frequency 63 125 250 500 1000 2000 4000 8000 Hz
- Sound pressure level 60 59 49 49 46 43 36 25 dB unweighted

Fan Data
- Fan type: RLA 31-2831-4E-S
- Motor type: MFA F0-0908-4E-K3-C0-S
- Operating capacitor: 4 $\mu$F
- Voltage $U = 220 \text{ V, 1~}$
- Input power $P_i = 0.19 \text{ kW}$
- A-weighted sound pressure level at 1.5m distance (mid filter) $L_{pA1.5}$ dB
- A-weighted sound power level $L_{wA6} = L_{pA1.5} + 10 \text{ dB}$
- Max. inputpower $P_{i,\text{max}} = 0.19 \text{ kW}$
- Max. current $I_{\text{max}} = 0.00 \text{ A}$
- Speed $N = 1340 \text{ 1/min}$

Filter Fan Units
RHA 0612-331-4E11-BAS

Air density $= 1.15 \text{ kg/m}^3$
**Filter Fan Units**

**RHA 0612-231-6E41-BAS**

- **Air density:** 1.15 kg/m³

**Data for duty point:**

- **Air velocity** $v$: 0.35 m/s ($q_v = 910$ m³/h)
- **Fan static pressure** $P_F$: 170 Pa (unit without filter, with inlet guard)
- **Voltage** $U$: 108 V
- **Speed** $N$: 922 1/min (on request)
- **Input Power** $P_e$: 164 W
- **Current** $I$: 1.56 A (on request)
- **Sound pressure level** $L_{PA1.5}$: 50 dB (with filter, A-weighted)
- **Sound pressure levels at octave frequencies** (on request)
  - Octave frequency: 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz
  - Sound pressure level: 61, 55, 47, 45, 47, 41, 33, 25 dB

**Anonymous motor**

- **1ph, 60 Hz**

**Fan Data**

- **Fan type**: RLA 21-0315-6E-S
- **Motor type**: MFA F0-0908-6E-K3-A0-S
- **Operating capacitor**: 12 µF
- **Voltage**: U
- **Input power**: $P_e$
- **A-weighted sound pressure level at 1.5m distance (mid filter)** $L_{PA1.5}$ dB
- **A-weighted sound power level** $L_{WA0}$

**Technical Details**

- **Fan weight (steel)**: m
  - 43 kg (without filter)
- **Fan weight (aluminium)**: m
  - 32 kg (without filter)
- **Voltage**: U
  - 120 V, 1~
- **Frequency**: f
  - 60 Hz
- **Max. input power**: $P_e,_{max}$
  - 0.20 kW
- **Max. current**: $I,_{max}$
  - 1.7 A
- **Speed**: N
  - 940 1/min
Filter Fan Units

**RHA 1212-240-6DB4-A**

Air density $\rho = 1.15 \text{ kg/m}^3$

### Data for duty point:
- **Air velocity** $v = 0.35 \text{ m/s}$ ($Q_v = 1815 \text{ m}^3/\text{h}$)
- **Fan static pressure** $p_{sf}$ = 170 Pa (unit without filter, with inlet guard)
- **Voltage** $U = 290 \text{ V}$
- **Speed** $N = 850 \text{ 1/min}$ (on request)
- **Input Power** $P_a = 290 \text{ W}$
- **Current** $I = 0.73 \text{ A}$ (on request)
- **Sound pressure level** $L_{pA1.5}$ = 48 dB (with filter, A-weighted)
- **Sound pressure levels at octave frequencies** (on request)
  - Octave frequency: 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz
  - Sound pressure level: 63, 54, 48, 45, 43, 33, 24, 19 dB

### Fan Data
- **Fan weight (steel)**: 55 kg (without filter)
- **Fan weight (aluminium)**: 38 kg (without filter)
- **Voltage** $U$ = 480 V (Y), 3~
- **Frequency** $f$ = 60 Hz
- **Max. inputpower** $P_{a,max}$ = 0.42 kW
- **Max. current** $I_{max}$ = 0.75 A
- **Speed** $N$ = 1070 1/min

### Motor Data
- **Motor type**: MFA F0-1112-6D-K7-91-S

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**Filter Fan Units**

Asynchronous motor

3ph, 60 Hz

1200×1200

(4’×4’)

---

**Fan Data**

<table>
<thead>
<tr>
<th>Fan type</th>
<th>RLA 21-0400-60-D-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor type</td>
<td>MFA F0-1112-60-K7-91-S</td>
</tr>
<tr>
<td>$U$ Voltage</td>
<td>$V$</td>
</tr>
<tr>
<td>$P_a$ Input power</td>
<td>$W$</td>
</tr>
<tr>
<td>$L_{pA1.5}$ A-weighted sound pressure level at 1.5m distance (mid filter) dB</td>
<td>$dB$</td>
</tr>
<tr>
<td>$L_{pA2}$ A-weighted sound power level = $L_{pA1.5} + 10 \text{ dB}$</td>
<td>$dB$</td>
</tr>
</tbody>
</table>
Filter Fan Units

**RHA 1212-240-6E45-BAS**

Air density = 1.15 kg/m³

**Data for duty point:**
- Air velocity $v = 0.35$ m/s, $(q_v = 1815$ m³/h)
- Fan static pressure $P_{SF} = 170$ Pa
  - (unit without filter, with inlet guard)
- Voltage $U = 99$ V
- Speed $N = 850$ 1/min (on request)
- Input Power $P_e = 325$ W
- Current $I = 3.6$ A (on request)
- Sound pressure level $L_{pA,1.5} = 53$ dB (with filter, A-weighted)
- Sound pressure levels at octave frequencies (on request)
  - Octave frequency: 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz
  - Sound pressure level 63, 55, 50, 51, 48, 45, 38, 26 dB

**Fan Data**
- Fan type: RLA 21-0400-6E-S
- Motor type: MFA F0-1117-6E-K7-A1-S
- Operating capacitor: $25 \mu F$
- Voltage $U$: $115$ V
- Frequency $f$: 60 Hz
- Max. input power $P_{e, \text{max}}$: 0.42 kW
- Max. current $I_{\text{max}}$: 3.6 A
- Speed $N$: 1030 1/min
- Fan weight (steel): 55 kg (without filter)
- Fan weight (aluminium): 38 kg (without filter)
- Voltage $U$: 120 V, 1~
- Input power $W$: $57$ dB
- A-weighted sound pressure level at 1.5m distance (mid filter) $dB$
- A-weighted sound power level: $L_{pA,1.5} + 10$ dB

**Diagram:**
- Air velocity $v$, 0.35 m/s
- Fan static pressure $P_{SF}$, 170 Pa
- Voltage $U$, 99 V
- Input Power $P_e$, 325 W
- Current $I$, 3.6 A
- Sound pressure level $L_{pA,1.5}$, 53 dB
- Octave frequency: 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz
- Sound pressure level: 61, 55, 50, 51, 48, 45, 38, 26 dB

**UL Certified:**
- 1200×1200 (4’×4’)
- Asynchronous motor
- 1ph, 60 Hz

**Specifications:**
- Dimensions: 1200×1200 (4’×4’)
- Fan type: RLA 21-0400-6E-S
- Motor type: MFA F0-1117-6E-K7-A1-S
- Operating capacitor: 25 µF
- Voltage: 115 V
- Frequency: 60 Hz
- Max. input power: 0.42 kW
- Max. current: 3.6 A
- Speed: 1030 1/min
- Fan weight (steel): 55 kg (without filter)
- Fan weight (aluminium): 38 kg (without filter)
- Voltage: 120 V, 1~
**Data for duty point:**

- Air velocity $v$ = 0.35 m/s ($q_v = 1360$ m$^3$/h)
- Fan static pressure $p_{sf}$ = 170 Pa (unit without filter, with inlet guard)
- Voltage $U$ = 260 V
- Speed $N$ = 980 1/min (on request)
- Input Power $P_e$ = 175 W
- Current $I$ = 0.49 A (on request)
- Sound pressure level $L_{pA1.5}$ = 51 dB (with filter, A-weighted)
- Sound pressure levels at octave frequencies (on request)
- Octave frequency = 63 125 250 500 1000 2000 4000 8000 Hz
- Sound pressure level $L_{pA1.5}$ unweighted = 55 dB

**Fan Data**

<table>
<thead>
<tr>
<th>Fan type</th>
<th>RLA 21-0315-6D-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor type</td>
<td>MFA F0-1112-6D-K7-91-S</td>
</tr>
<tr>
<td>U Voltage</td>
<td>V</td>
</tr>
<tr>
<td>$P_e$ Input power</td>
<td>W</td>
</tr>
<tr>
<td>$L_{pA1.5}$ A-weighted sound pressure level at 1.5m distance (mid filter) dB</td>
<td></td>
</tr>
<tr>
<td>$L_{pA6}$ A-weighted sound power level $= L_{pA1.5} + 10$ dB</td>
<td></td>
</tr>
</tbody>
</table>

**Motor Data**

| Voltage $U$ | 480 V (Y), 3~ |
| Frequency $f$ | 60 Hz |
| Max. inputpower $P_{e,max}$ | 0.25 kW |
| Max. current $I_{e,max}$ | 0.55 A |
| Speed $N$ | 1140 1/min |

Air density $\rho$ = 1.15 kg/m$^3$
**Data for duty point:**

- **Air velocity** $v$: 0.35 m/s ($q_v = 1360$ m$^3$/h)
- **Fan static pressure** $p_{SF}$: 170 Pa (unit without filter, with inlet guard)
- **Voltage** $U$: 100 V
- **Speed** $N$: 980 1/min (on request)
- **Input Power** $P_e$: 195 W
- **Current** $I$: 2.1 A (on request)
- **Sound pressure level** $L_{A,1.5}$: 51 dB (with filter, A-weighted)
- **Sound pressure levels at octave frequencies** (on request)
  - Octave frequency: 63, 125, 250, 500, 1000, 2000, 4000, 8000 Hz
  - Sound pressure level: 59, 55, 50, 49, 46, 43, 33, 24 dB (unweighted)

**Fan Data**

- **Fan type**: RLA 21-0315-6E-S
- **Motor type**: MFA F0-0911-6E-K7-A0-S
- **Operating capacitor**: 16 µF
- **Voltage** $U$: 115 V, 1~
- **Frequency** $f$: 60 Hz
- **Max. input power** $P_{e,\text{max}}$: 0.24 kW
- **Max. current** $I_{\text{max}}$: 2.1 A
- **Speed** $N$: 1070 1/min

**Motor Data**

- **Voltage** $U$: 120 V
- **Frequency** $f$: 60 Hz
- **Max. input power** $P_{e,\text{max}}$: 0.24 kW
- **Max. current** $I_{\text{max}}$: 2.1 A
Data for duty point:
- Air velocity $v$: 0.35 m/s ($qv = 910$ m$^3$/h)
- Fan static pressure $p_{SF}$: 170 Pa (unit without filter, with inlet guard)
- Voltage $U$: 240 V
- Speed $N$: 1240 1/min (on request)
- Input Power $P_e$: 189 W
- Current $I$: 0.56 A (on request)
- Sound pressure level $L_{PA1.5}$: 50 dB (with filter, A-weighted)
- Sound pressure levels at octave frequencies (on request)
- Octave frequency: 63 125 250 500 1000 2000 4000 8000 Hz
- Sound pressure level unweighted

Fan Data
- Fan weight (steel) $m$: 43 kg (without filter)
- Fan weight (aluminium) $m$: 32 kg (without filter)
- Voltage $U$: 480 V (Y), 3~
- Frequency $f$: 60 Hz
- Max. inputpower $P_{e,max}$: 0.31 kW
- Max. current $I_{max}$: 0.60 A
- Speed $N$: 1660 1/min

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Filter Fan Units
RHA 0612-331-4DB4-A

Air density = 1.15 kg/m$^3$

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Asynchronous motor
3ph, 60 Hz

600×1200
(2’×4’)

Fan Data

<table>
<thead>
<tr>
<th>Fan data</th>
<th>RLA 31-2831-4D-S</th>
<th>MFA F0-0911-4D-K7-90-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan weight (steel)</td>
<td>$m$</td>
<td>43 kg (without filter)</td>
</tr>
<tr>
<td>Fan weight (aluminium)</td>
<td>$m$</td>
<td>32 kg (without filter)</td>
</tr>
<tr>
<td>Voltage</td>
<td>$U$</td>
<td>480 V (Y), 3~</td>
</tr>
<tr>
<td>Input power</td>
<td>$P_e$</td>
<td>189 W</td>
</tr>
<tr>
<td>$L_{PA1.5}$</td>
<td>A-weighted sound pressure level at 1.5m distance (mid filter) dB</td>
<td></td>
</tr>
<tr>
<td>$L_{PA6}$</td>
<td>A-weighted sound power level $= L_{PA1.5} + 10$ dB</td>
<td></td>
</tr>
<tr>
<td>Max. inputpower</td>
<td>$P_{e,max}$</td>
<td>0.31 kW</td>
</tr>
<tr>
<td>Max. current</td>
<td>$I_{max}$</td>
<td>0.60 A</td>
</tr>
<tr>
<td>Speed</td>
<td>$N$</td>
<td>1660 1/min</td>
</tr>
</tbody>
</table>
Filter Fan Units

RHA 0612-231-6E43-BAS

Data for duty point:

<table>
<thead>
<tr>
<th>Air velocity $\nu$</th>
<th>0.35 m/s</th>
<th>($qv = 910$ m³/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan static pressure $\Delta p_F$</td>
<td>170 Pa</td>
<td>(unit without filter, with inlet guard)</td>
</tr>
<tr>
<td>Voltage $U$</td>
<td>92 V</td>
<td></td>
</tr>
<tr>
<td>Speed $N$</td>
<td>920 1/min</td>
<td>(on request)</td>
</tr>
<tr>
<td>Input Power $P_e$</td>
<td>172 W</td>
<td></td>
</tr>
<tr>
<td>Current $I$</td>
<td>2.0 A</td>
<td>(on request)</td>
</tr>
<tr>
<td>Sound pressure level $L_{pA1.5}$</td>
<td>50 dB</td>
<td>(with filter, A-weighted)</td>
</tr>
<tr>
<td>Sound pressure levels at octave frequencies (on request)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Octave frequency</td>
<td>63</td>
<td>125</td>
</tr>
<tr>
<td>Sound pressure level (unweighted)</td>
<td>62</td>
<td>55</td>
</tr>
</tbody>
</table>

Fan Data

- Fan type: RLA 21-0315-6E-S
- Motor type: MFA F0-0911-6E-K7-A0-S
- Operating capacitor: 16 µF
- Voltage $U$: 115 V - valid for UL-version
- Voltage $U$: 120 V, 1~
- Frequency $f$: 60 Hz
- Max. input power $P_{e,\text{max}}$: 0.24 kW
- Max. current $I_{\text{max}}$: 2.1 A
- Speed $N$: 1070 1/min

Fan weight (steel): m 43 kg (without filter)
Fan weight (aluminium): m 32 kg (without filter)
Input power $W$: W
A-weighted sound pressure level at 1.5m distance (mid filter) dB $L_{pA1.5}$
A-weighted sound power level = $L_{pA1.5} + 10$ dB

Asynchronous motor
1ph, 60 Hz

600×1200 (2’×4’)