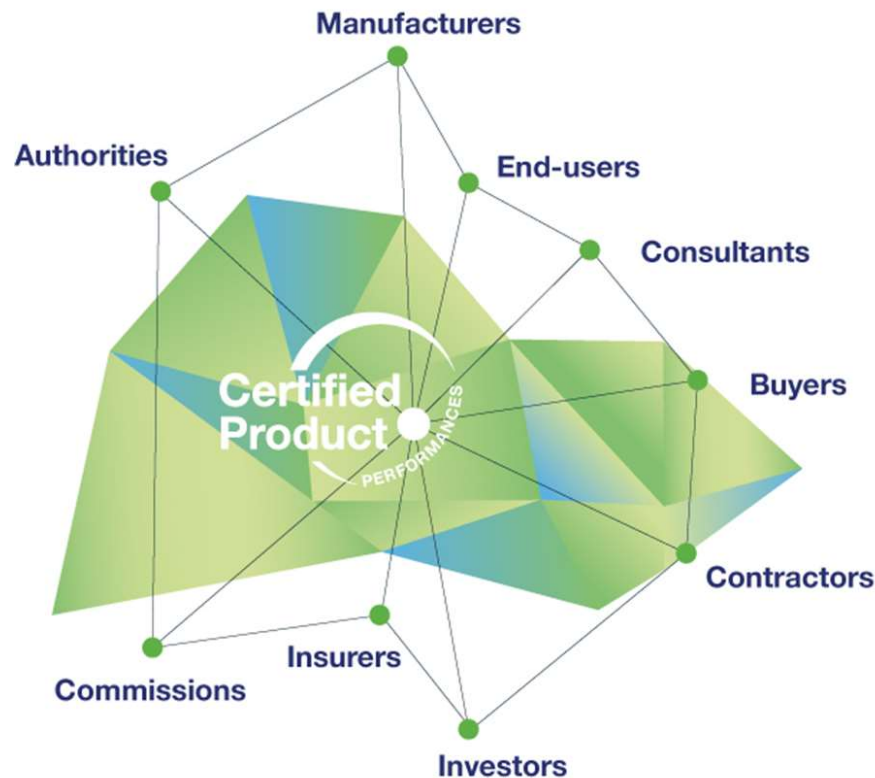


# IAQ in Schools: Certification of Energy Efficient solutions

Indoor climate  
Ventilation & Air quality  
Refrigeration & Food cold chain



Eric FOUCHEROT

International Affairs

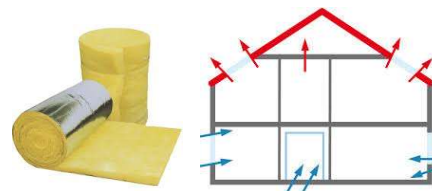
[e.foucherot@eurovent-certification.com](mailto:e.foucherot@eurovent-certification.com)

# Trends for Public Building Regulations : Energy Efficiency AND better Indoor Air Quality

## Increase of Energy building regulations



National building codes, EPBD



Insulation and airtightness are improving



**Needs for improved  
Air Management**

## Example : French IAQ regulation for Schools

Le nouveau dispositif réglementaire 2018-2023



La surveillance de  
**la qualité de  
l'air intérieur**  
dans les lieux  
accueillant des enfants

Le rôle des collectivités locales  
et des gestionnaires de structures privées



**Enforced since January 2018**

Substances	Valeur-guide pour l'air intérieur		Valeur-limite
<b>Formaldéhyde</b>	<b>30 <math>\mu\text{g}/\text{m}^3</math></b> pour une exposition de longue durée à compter du 1 <sup>er</sup> janvier 2015	<b>10 <math>\mu\text{g}/\text{m}^3</math></b> pour une exposition de longue durée à compter du 1 <sup>er</sup> janvier 2023	100 $\mu\text{g}/\text{m}^3$
<b>Benzène</b>	<b>5 <math>\mu\text{g}/\text{m}^3</math></b> pour une exposition de longue durée à compter du 1 <sup>er</sup> janvier 2013	<b>2 <math>\mu\text{g}/\text{m}^3</math></b> pour une exposition de longue durée à compter du 1 <sup>er</sup> janvier 2016	10 $\mu\text{g}/\text{m}^3$
<b>Dioxyde de carbone</b>			Indice de confinement de niveau 5*
<b>Tétrachloro-éthylène</b>			1250 $\mu\text{g}/\text{m}^3$

Un indice de confinement de 5 correspond à des pics de concentration en CO2 élevés supérieurs à 4 000 ppm (partie par million) et à des valeurs moyennes pendant l'occupation supérieures à 2 000 ppm.

# INDIA : Inputs from Bureau of Energy Efficiency

## Energy Management IN YOUR SCHOOL



Identifying Energy  
Saving Opportunities

### USING WINDOW UNITS AND/OR SPLIT AIR CONDITIONERS (ACs)

Window units and split ACs comprise options provided under the realm of domestic refrigerative air conditioners. Here the compressor is located separately to a cooling head that is usually mounted on a wall or ceiling inside the building. The compressor can be in a less obtrusive outside location, provides for quieter operation and is connected to the cooling head by insulated pipes.

Refrigerative air conditioners are sized in kW according to the rate at which they can transfer heat. This rating of an air conditioner's cooling ability is usually 2 to 2.5 times the electrical power required for their operation. The correct size of an air conditioning system depends on many factors including: building construction, level of insulation, shading of windows, room size, number of people in the room and their activity and the presence of other heat generating sources such as computers and lights. A north-facing General Purpose Classroom measuring 7.2 m x 7.2 m with 25 students and three computers would require about 9 kW of cooling. It should be

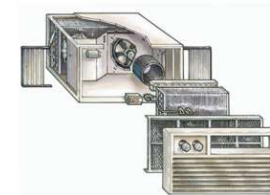
**B. Replace/Clean Filters & Coils.** It's one of the simplest of the conservation measures, and it's often overlooked. Take time to check that there are filters in place and see that coils and filters are cleaned and changed regularly. Filters and coils are the two most critical elements in any cooling system depending on whether they utilize window units, split air conditioners and/or HVAC systems. They are where the mechanical system interacts most directly with the environment it is trying to impact. It does not take much dirt and dust to degrade thermal transfer across the coils, and as filters get dirtier, air delivery to spaces and fan energy required to deliver air will suffer. Very aggressive cleaning schedules for coils and filters are always a part of the maintenance regime for buildings. It is very common to observe dirty filters and coils even when maintenance staff reports an aggressive approach. Often, teams will rely on pressure drop alarms in the BAS system to signal the need for filter cleaning. Our experience in the field indicates that this is not a proactive approach associated with capturing available low-cost savings.

Ensure that there is regular maintenance



Examples of Filters

can easily be determined by wiping the surface with a finger or clean cloth. As this measure is less popular with maintenance staff, motivation and oversight are required, which might result in a checklist that appoints a responsible staff person to ensure on time completion. Replaceable filters can be cleaned in batches to reduce labor associated with this measure, and pre-filters can be considered depending on local condition. Where coils and filters are difficult to access, it is important to document the process, appoint specific staff who can



Window AC.

When buying an air-conditioner (window or split unit), always buy BEE labeled air conditioners having rating between 3 to 5 stars. Use the table given in the picture in the following page to choose the AC unit for your school.



# INDIA : Inputs from Bureau of Energy Efficiency

An energy efficiency checklist is provided below as a template that can be modified and used by your school. This is included to provide a quick overview of measures that you can consider for the various systems in your school.

## 1.0 Envelope

- Reduce Heat Losses-Ceiling/roof
  - o Better Ceiling/Roof Insulation
  - o Use Light-Colored Roof Surfaces
- Reduce Heat Losses-Walls/floors
- Use Light Colored Exterior Surfaces
- Thermal Mass/Passive Solar Heating
- Reduce Heat Losses-Windows/Doors
  - o Install Additional Glazing Layer
  - o Use Special Coatings or Gases
    - Heat mirror
    - low-e coatings
    - Argon gas window fill
- Reduce Heat Gain--Windows/Doors
  - o Install Exterior Shading
  - o Install Interior Shading
  - o Use Tinted or Reflective Coatings or Films
  - o Optimize Window Sizing and Orientation
- Reduce Infiltration
  - o Caulk and Weather strip Doors and Windows
  - o Install Air-Lock Vestibule System or Revolving Doors

## 2.0 Lighting

- Reduce Lighting Required
  - o Utilize Task Lighting
  - o Lighting Controls
    - Selective switching
    - Programmable timing control
    - Occupancy sensors
    - Energy management system
  - o Use Light-Colored Interior Wall Finishes
- Install More Energy-Efficient Lighting System
  - o Use High-Efficiency Fixtures
    - HID fixtures in selected locations
    - Efficient exit signs
    - Self-ballasted compact fluorescents
  - o Use Efficient Exterior Fixtures
    - High-pressure sodium HID fixtures
    - Metal halide fixtures
  - o Use High-Efficiency Ballast
    - Electromagnetic
- Use Day lighting
  - o Install Dimming Controls
  - o Architectural Modifications

## 3.0 HVAC Systems

- Air Distribution Systems
  - o Reduce Energy Losses
    - Increase duct insulation
    - Install air-to-air heat recovery
    - Runaround loop heat recovery
  - o Reduce System Flow Rates
    - Reduce System Flow Rates
    - Airflow and fan speed reduction

- VAV system to reduce fan energy use
- Variable speed drive motor for VAV
- o Reduce System Resistance
  - High-efficiency filters
  - Improve design and balance of duct system
- o Reduce Ventilation Loads
  - Reduce ventilation rate to minimum
  - Install local ventilation and makeup air hoods
- o Air De-stratification
  - Enclosed high-velocity fan
  - Open propeller fans
  - Ductwork system with centrifugal or vane axial fans

## 3.1 Water Distribution

- Reduce System Flow Rates
  - o Primary/secondary pumping with variable speed motors
  - o Isolate off-line equipment in parallel piping circuits
  - o Time control or interlocks on circulating pumps
- Reduce System Resistance
  - o Install booster pumps

## 3.2 Cooling Plant

- Select More Efficient Cooling System
  - o Use evaporative cooling
  - o Use cooling tower instead of air-cooled system
- Improve Cooling Efficiency
  - o Optimize chiller efficiency with temperature controls
  - o Use multiple chillers and optimization controls

- o Increase chilled water design temperature
- o Optimize cooling tower flow controls
- Increase Condensing Efficiency
  - o Lower condenser water design temperature
  - o Reset controls on water temperature
  - o Tube-brush cleaning system
  - o Chemical washing system
- Improve Part-Load Performance
  - o Select chillers based on Integrated Part Load Value (IPLV)

## 4.0 Water Heating

- Reduce Water Heating Loads
  - o Use solar water heating system
- Reduce System Losses
  - o Increase Insulation on Hot Water Pipes
  - o Increase Insulation on Water Storage Tanks

## 5.0 Power Systems

- Reduce Power System Losses
  - o Correct Power Factors
  - o Install Energy-Efficient Transformers
- Install Energy-Efficient Motors
  - o High-Efficiency Motors
  - o Variable Speed Motors
  - o Optimize Motor Sizing

## 6.0 Refrigerators

- Improve efficiency
  - o Buy BEE labeled energy efficient refrigerators

# Matching Energy Efficiency & Indoor Air Quality

## Environmental context



Environmental Challenges



Comfort



Energy Performance



Quality

**“Indoor air quality is a key element of building performance”**

*Hywel Davies, CIBSE technical director*

## Eurovent Certita Certification



- ✓ Independent European Certification body
- ✓ 55 professionals of audit & HVACR specialist
- ✓ European reference since 1994
- ✓ Turnover 17 M€
- ✓ Almost 50 certification schemes

As a certification body accredited by Cofrac – Accreditation 5-5017 - Eurovent Certita Certification fulfills the requirements of the standards EN ISO/CEI 17065:2012.

A list of EA members is available at:

<http://www.european-accreditation.org/ea-members>

# HVAC&R Products Certification : Increasing number of IAQ related programmes

**AIR CONDITIONERS**



**CHILLERS & HEAT PUMPS**



**FAN COILS UNITS**



**CHILLED BEAMS**



**REFRIGERATED DISPLAY CABINETS**



**VENTILATION DUCTS**



**HEAT EXCHANGERS FOR REFRIGERATION**



**HEATING & COOLING COILS**



**AIR FILTERS**



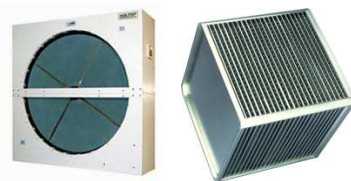
**AIR HANDLING UNITS**



**RESIDENTIAL AHU**



**AIRtoAIR ENERGY EXCHANGERS**



**COOLING TOWERS**



**DRIFT ELIMINATORS**



**VRF**



**ROOFTOPS**



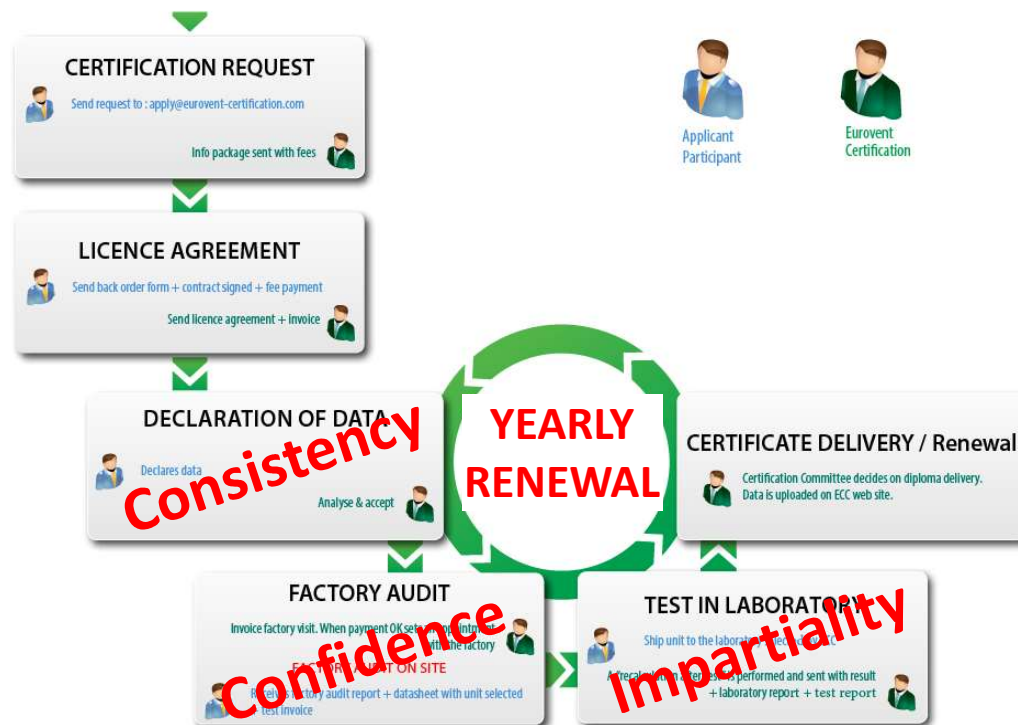


## Is 3<sup>rd</sup> Party Certification useful ? Is 3<sup>rd</sup> Party PERFORMANCE Certification helpful ?

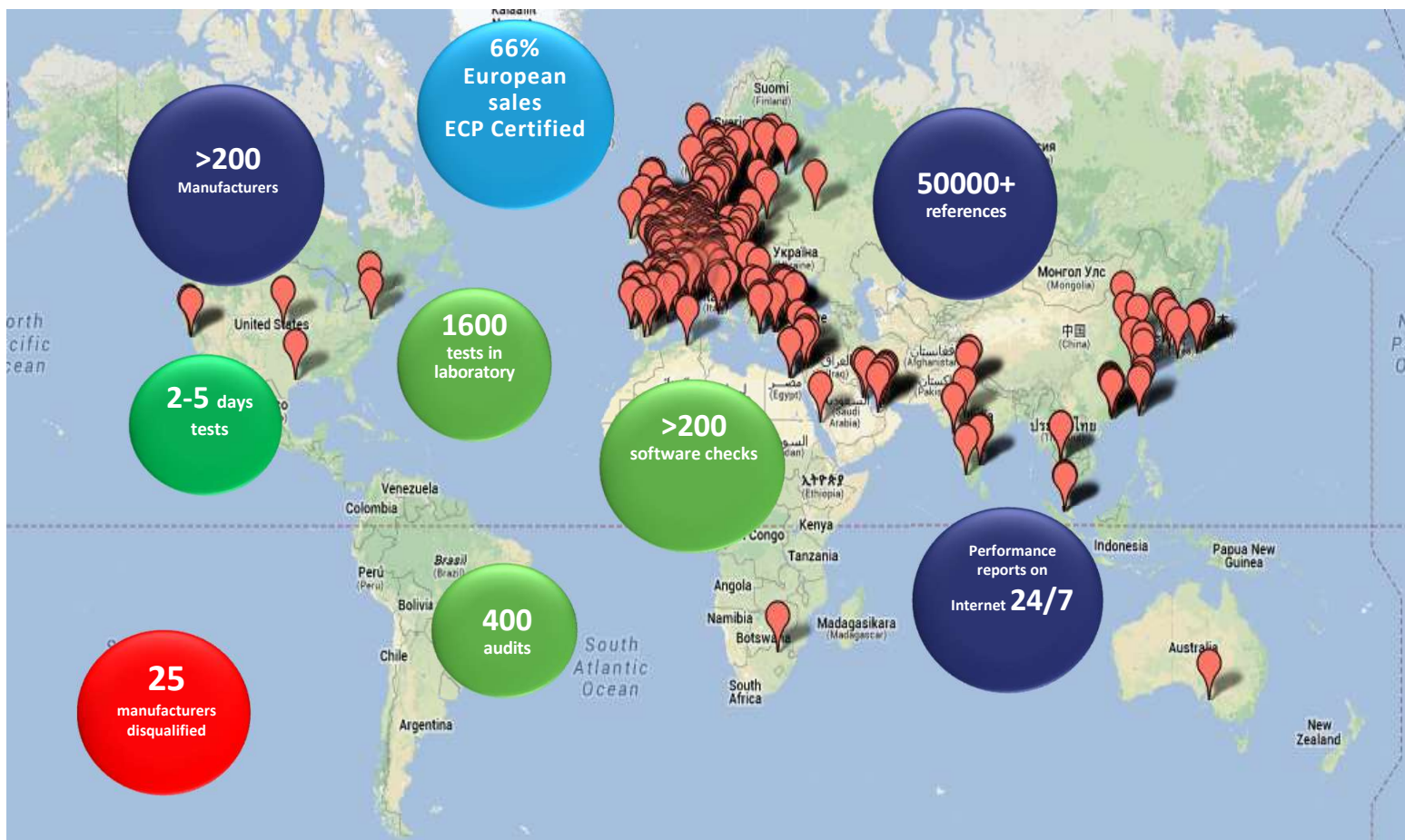


## Certification process

To bring you peace of mind

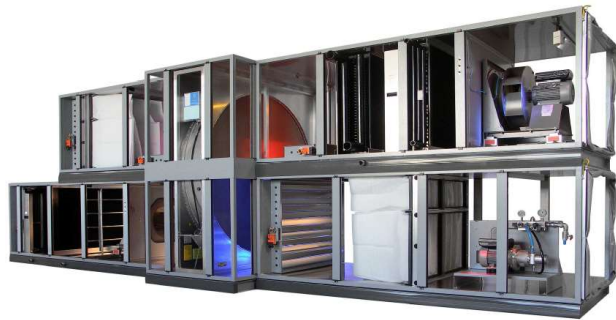


## The sun never sets on ECP Mark





# Reference in AHU Certification

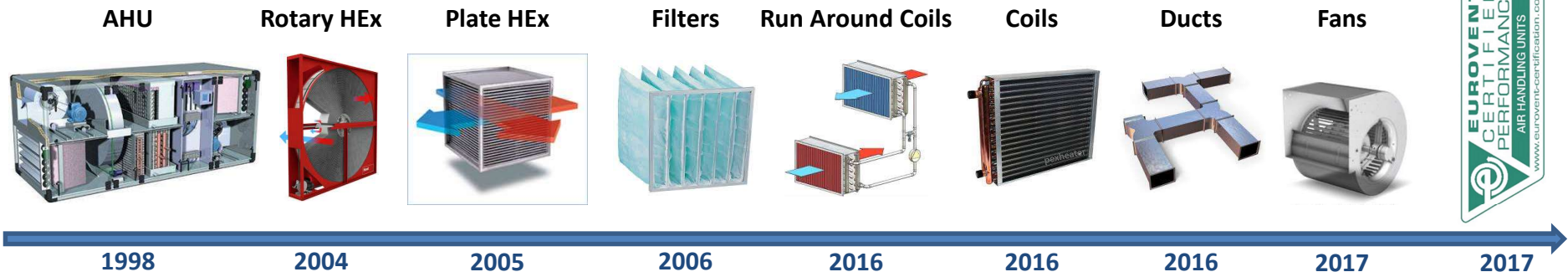


Testing standards: EN 13053

Certified: Mechanical characteristics & Thermal performance, Selection software consistency

AHU Energy Efficiency rated datas:

$v$ : Air velocity in the fan section (V)  
 $\eta$ : Energy recovery efficiency  
 $\Delta P$ : pressure drop  
 NG: Fan efficiency







# Hygienic AHU Certification



**Hotels**



**Schools / University**



**Offices**



**Retails**



## Hygienic AHU Certification



Hospitals

*A level 2 AHU is also suitable for office, school, hotel or retail*

## Hygienic AHU Certification



**Food  
Process**



**Pharmaceutical**



**White Room**

*A level 3 Hygienic AHU is also suitable for hospitals, office, school, ...*

## Hygienic option : 60 requirements organized in 3 categories



**General (Manufacture, Shipment, etc.)**




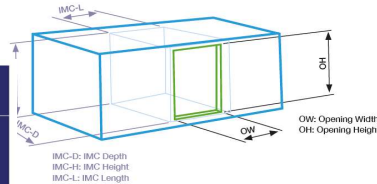
**Unit Housing (Material, Maintenance, AHU arrangement, etc.)**



**Air Treatment (Filter, Coils, Fans, etc.)**

Compared to existing hygienic certification, each requirement is quantified or clearly defined

AHU section size (+/- 1%)		All levels	Level 1	Level 2	Level 3
Internal unit Depth (= IMC-D) per air stream	Internal unit Height (=IMC-H) per air stream	Designed type of IMC (after entering the unit, all relevant inner surfaces shall be reached with the hand)	Minimum IMC Length IMC-L (for quickly removable components: including free space when component is removed)		
<800 mm	>300 mm and <1900 mm	Standing outside and entering the unit with the arm or with the arm plus the shoulder 	250 mm	400 mm	550 mm
≤1000 mm	>400 mm and <1900 mm		400 mm	400 mm	550 mm



Factors decisive  
for the supply-air quality  
to be achieved include the  
accessibility for inspection  
and cleaning of wet and  
contaminated surfaces in  
contact with the handled air.

	Offices, schools, hotels, retail ... Level 1 ★☆☆	Hospitals Level 2 ★★☆☆	Pharmaceutical, food processes, white rooms Level 3 ★★★
Corrosivity class for metallic materials	At least C3		At least C4
Thermal Bridging class	At least TB3		At least TB2
Casing Air leakage Class	At least L2 (M) & L2(F)		At least L1 (M) & L1(F)
Water Drainage from pans, condense trays and water tanks	95%		
Filters class (supply side)	F7		F9
Number of filter on supply side	1	2	
Fin thickness	0.10 mm	0.12 mm	
Minimum distance between fins (cooler)	2.5 mm		3.0 mm
Minimum distance between fins (heating)	2.0 mm		2.5 mm

Specifications are subject to change without notice.




## Hygienic AHU Certification

	Offices, schools, hotels, retail ... Level 1 ★☆☆	Hospitals Level 2 ★★★	Pharmaceutical, food processes, white rooms Level 3 ★★★
Corrosivity class for metallic materials	At least C3		At least C4
Thermal Bridging class	At least TB3		At least TB2
Casing Air leakage Class	At least L2 (M) & L2(R)		At least L1 (M) & L1(R)
Water Drainage from pans, condense trays and water tanks	95%		
Filters class (supply side)	F7		F9
Number of filter on supply side	1	2	
Fin thickness	0.10 mm	0.12 mm	
Minimum distance between fins (cooler)	2.5 mm		3.0 mm
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*Specifications are subject to change without notice.*

## Hygienic AHU Certification

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< 800 mm	> 300 mm and < 1900 mm	Standing outside and entering the unit with the arm or with the arm plus the shoulder 	250 mm	400 mm	550 mm
≤ 1000 mm	> 400 mm and < 1900 mm		400 mm	400 mm	550 mm

# Residential Air Filters Efficiency rating

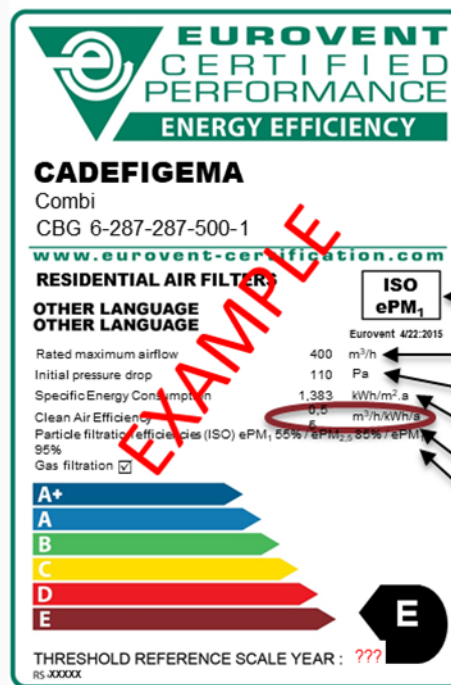


OM-21-2017  
Published April 2017



OPERATIONAL MANUAL  
for the  
CERTIFICATION  
of  
Residential Air Filters

RATING STANDARD  
for the  
CERTIFICATION  
of  
Residential Air Filters

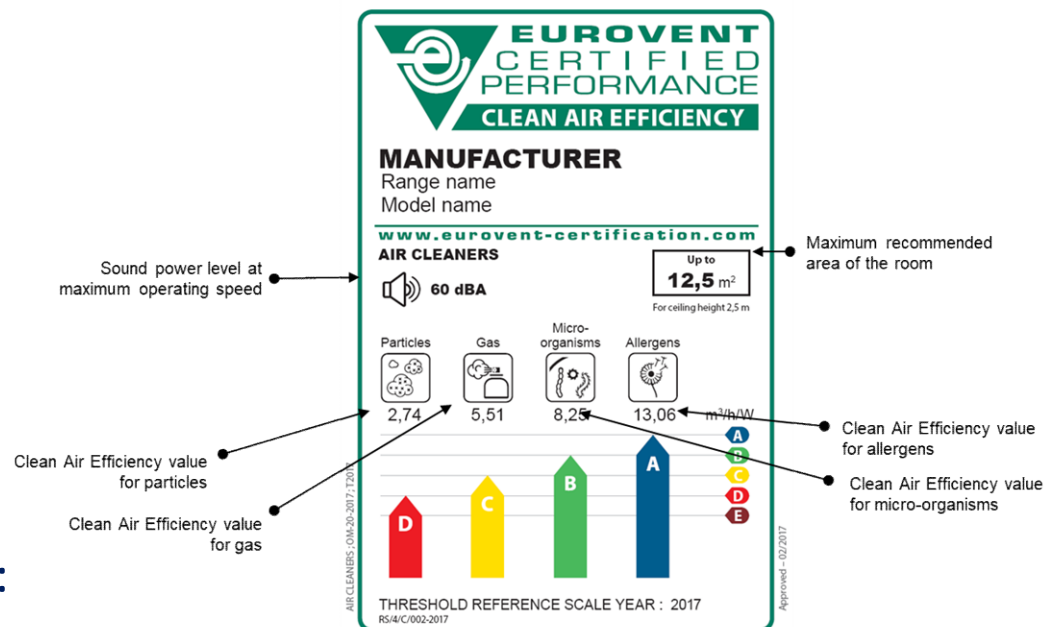


# Air Cleaners Efficiency Labelling



- Filtration efficiencies against:
  - Particulate Matter
  - Gaseous pollutants
  - Micro-organisms
  - Allergens

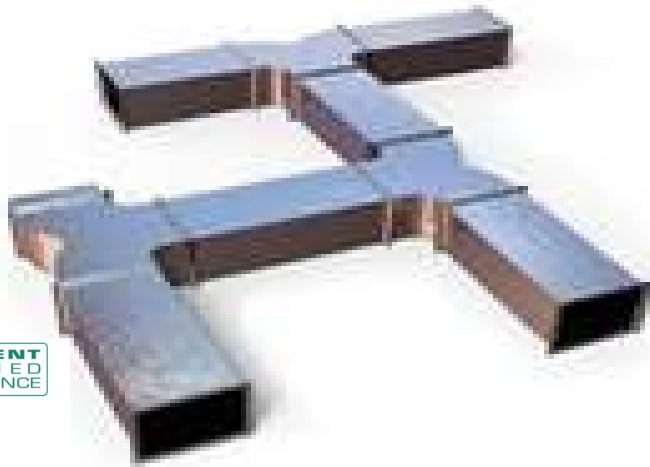
➤ Launched in **2017**



$$\text{Clean Air Efficiency} = \frac{\text{purified air flow rate for a given pollutant category}}{\text{absorbed electrical power at maximum speed}}$$

Clean Air Efficiency class	Clean Air Efficiency value
A	13 m³/h/W ≤ CAE
B	7 m³/h/W ≤ CAE < 13 m³/h/W
C	5 m³/h/W ≤ CAE < 7 m³/h/W
D	2 m³/h/W ≤ CAE < 5 m³/h/W
E	CAE < 2 m³/h/W





OM-19-2016  
Published August 2016



OPERATIONAL MANUAL  
for the  
CERTIFICATION  
of  
Ventilation Ducts

2/C/002MC - 2016  
Published August 2016

RS/2/C/003MR  
Published August 2016

RATING STANDARD  
for the certification of  
Rigid Metallic Ductwork Systems with  
Circular Cross-section

2/C/004P - 2016  
Published August 2016

RATING STANDARD  
for the certification of  
Rigid Metallic Ductwork Systems with  
Rectangular Cross-section

RATING STANDARD  
for the certification of  
Semi-Rigid Non-Metallic Ductwork  
Systems predominantly made of Plastics

## For DUCT-MC and DUCT MR

- ✓ Air tightness class (A, B, C or D)
- ✓ Static gauge pressure limits (positive and negative) in Pa
- ✓ Dimensions compliance to applicable standard (EN 1505:1998 or EN 1506:2007 )

## For DUCT-P

- ✓ Air tightness class (A, B, C or D)
- ✓ Design operating pressures (positive and negative) in Pa
- ✓ Minimum and maximum service temperatures in °C
- ✓ Resistance to external pressure : force F in N

# THANK YOU

