



Bus & Coach
HVAC Systems





eCo3 Air Purifier

01 Origin

02 Features

03 How does it work?

04 Benefits

05 Installation

Consequences of poor indoor air quality:

- Unpleasant environment
- Concentration of germs, bacteria, viruses, etc.
- Increase of breathing diseases
- Unpleasant odours
- Tiredness
- Dizziness

How to increase air quality inside the bus?

Avoiding pollution sources

- Not possible acting over environment pollution.
- Not possible avoiding traffic jams or heavy traffic areas in the cities.
- Not possible preventing people with breathing diseases travelling in the bus.
- In real life: Keeping filters and airducts in optimum condition is difficult and costly.

How to increase air quality inside the bus?

Improving ventilation


- Implies a reduction in the cooling capacity of the HVAC unit.
- ↓ Energy efficiency. ↑ Diesel consumption.
- Useless if the outside environment is polluted.

Air Purifier

Appears as the best solution.



Technical literacy
about air quality




B8 The bus must offer an attractive **olfactive environment** to passengers

Functional requirement

Underlying motivation

- Absence of areas where strong smelling objects might stagnate.
- Guaranteed elimination of bacteria by normal cleaning.
- Absence of accumulated dirt and damp in materials (seats, walls, ceiling etc.).
- Quality of air vented in (see sheet B10).

OVERALL COMFORT



Air renewal 12 to 30 times per hour - UTP recommendation (REC-15).

- Improved air renewal with piped in airflow at ceiling level and extraction at ground level (hot air rises, damp moves downward).
- Avoid corners and hollow surfaces where water could stagnate.
- Renew and cool air to avoid perspiration.
- Diffuse odour-absorbing scents.

Indoor air pollutants are unwanted, sometimes harmful materials in the air. Indoor air pollution is among the top five environmental health risks.

olfactive environment

clean space.

Goals

stagnate.
seats, walls,

Minimum performance requirements

and testing.

Means of assessment

Regulations and standards

Technical recommendations

inlets (when following
in tunnels).

On board: B10.

Units

INNOVATIVE FEATURE

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European Bus of the Future

European Bus of the Future

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eCo3 Air Purifier



Located in evaporator return air.

Modular design:

- 1 module for vehicles ≤ 7 metres long
- 2 modules for 12 metres long buses
- 4 modules for articulated buses / double decker

It works when evaporator blowers are on (AC, Heating, Ventilation).

Does not affect cooling capacity of the unit.

Minimum electric consumption: Suitable for EV.



Voltage	24 VDC
Consumption	40 mA
Weight	230 g
Temp. Range	-10°C - 65°C

Crown effect.

Suitable for New units & Retrofitting.

No maintenance.

20,000 hours lifetime.

Only maintenance required is cleaning dust with low pressure air.

Performance certified by SGS (independent company from Hispacold)



It generates ions and ozone in the right proportion.

OZONE

Healthy proportion

Natural O_3 proportion in the troposphere: 0.02 - 0.1 ppm

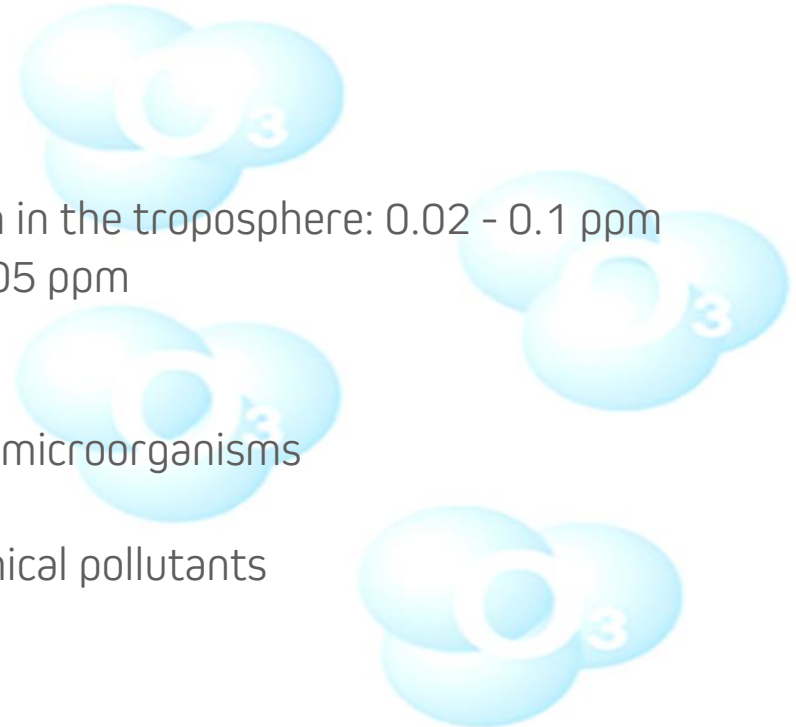
WHO recommends 0.05 ppm

Benefits

Disinfects. Eliminates microorganisms

Removes odours

Eliminates some chemical pollutants



IONS

Healthy proportion

80% negative ions

20% positive ions

Effects of negative ions

Cleaner air

Improves oxygen absorption

Helps eliminating CO₂ in blood



Ozone (O_3)

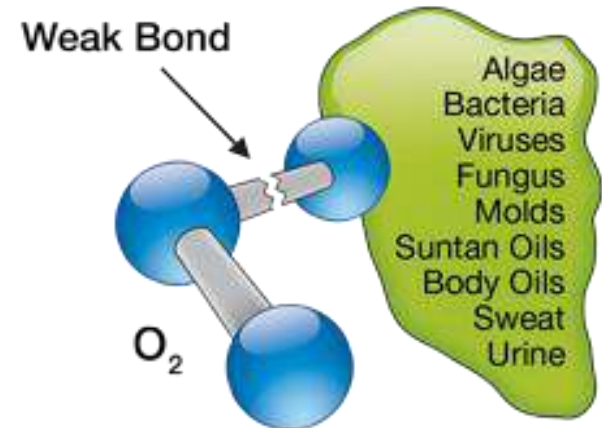
It contains one more oxygen atom than the oxygen molecule (O_2).

Ozone molecule is unstable, because the third oxygen atom is linked through a weak bond.

Ozone molecule will eventually split, allowing the third oxygen atom to react with other organic or inorganic molecules present in the environment, that will be destroyed by oxidation.

↓
Continuous cleaning

Only the initial oxygen molecule remains after this process.



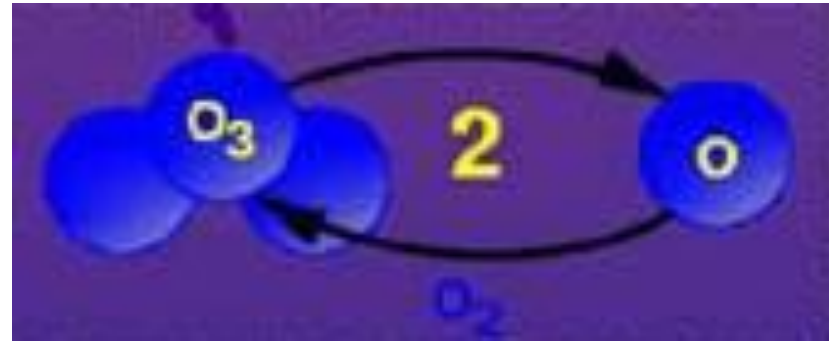
Removes unpleasant odours

Ions and ozone modify the chemical structure of the organic molecules, turning them into odourless ones.

Unpleasant odours are removed, not hidden.

Increases oxygen proportion

Ozone is an unstable molecule, and will turn into oxygen some time after having been generated by the air purifier.

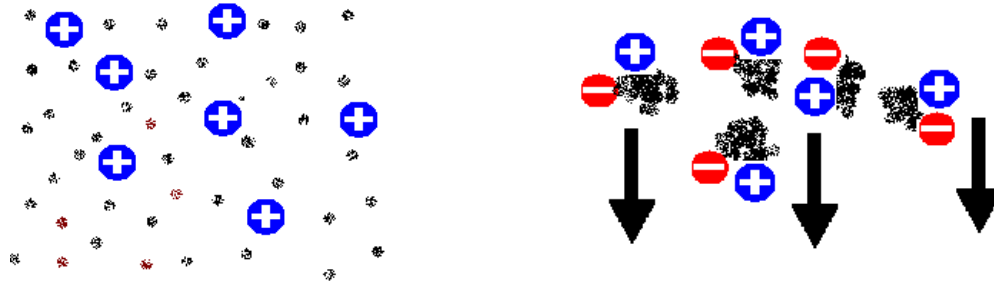


Reduces driver tiredness

Poor quality air, and low oxygen proportion contribute to driver tiredness. Air purifier keeps the natural oxygen proportion inside the vehicle, thus reducing driver tiredness.

Reduces particles suspended in the air

Ions generated by the air purifier join to the particles suspended in the air inside the vehicle (dust, pollen, etc.) increasing its weight and making them fall to the floor, where they can be easily cleaned.



Eliminates some chemical pollutants

Ions and ozone react with the molecules of some of the chemical pollutants present inside the vehicle, turning them into harmless substances.

Eliminates static load in electronic devices

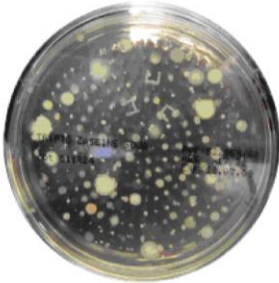
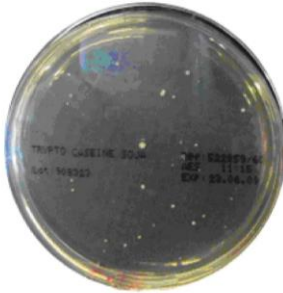


Negative ions generated by the air purifier react with the positive ions generated by the electronic devices, neutralising them.

UNE 100012:2005

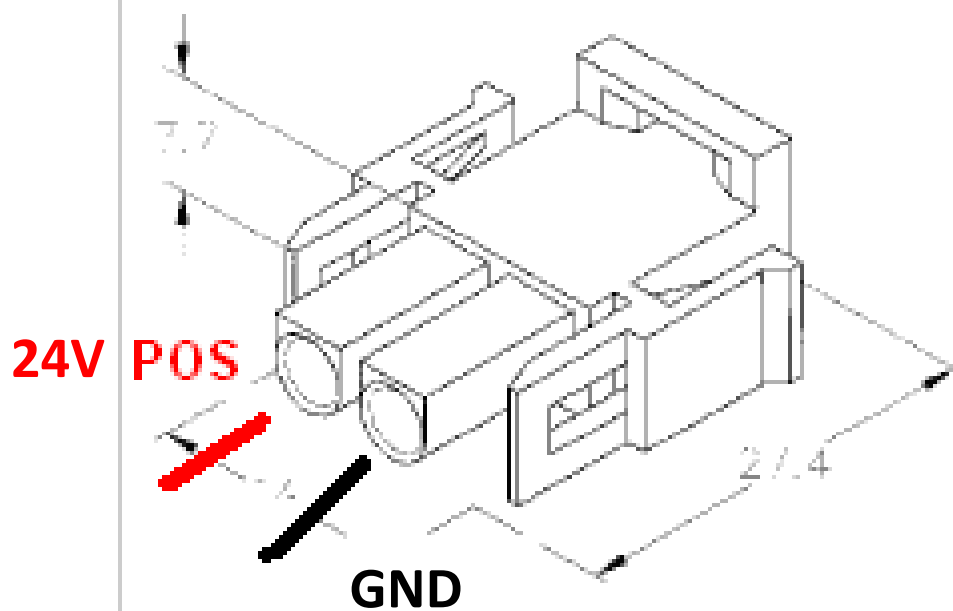
The standard allows maximum proportion of 800 CFU/ m³

CFU = Colony-forming Units

In case CFU proportion is exceeded, corrective measures shall be taken.

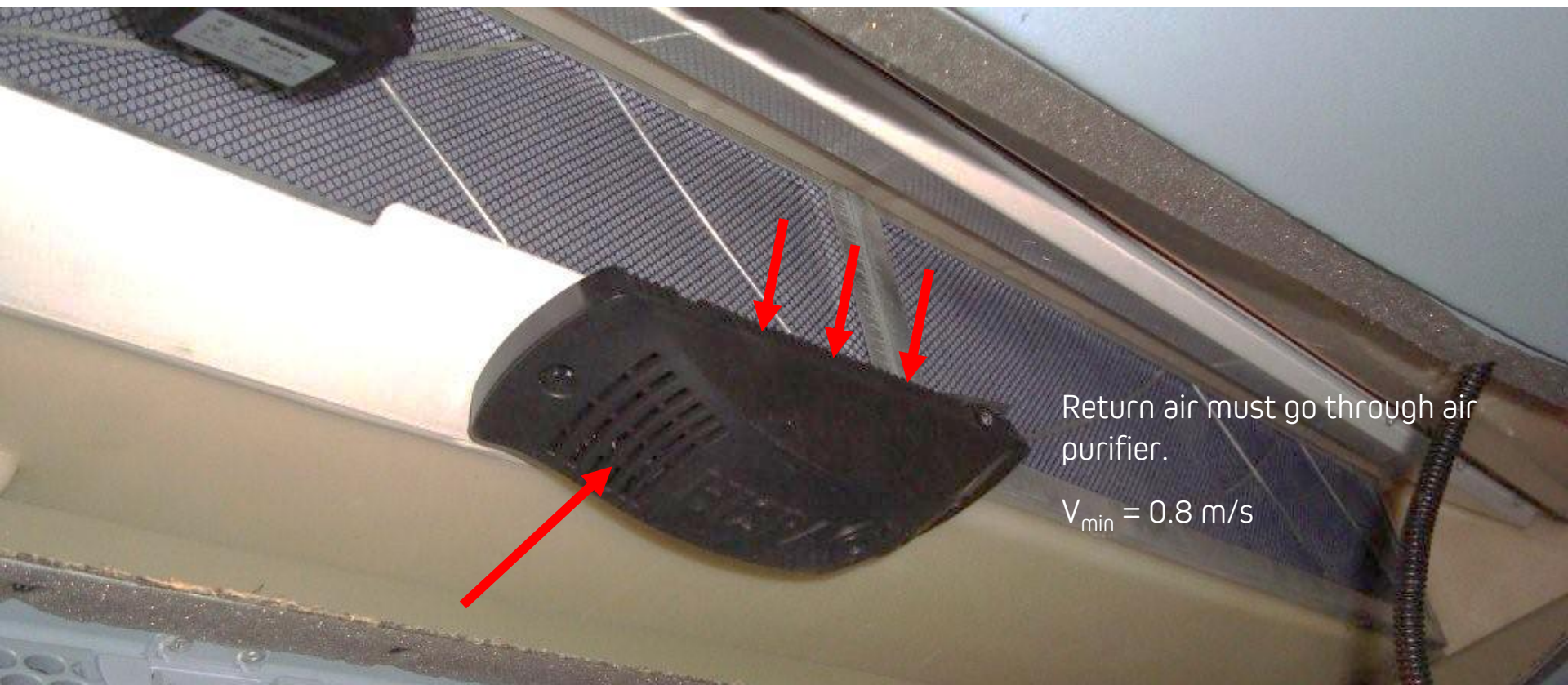
	Without eCo3	With eCo3
Bacteria	 <p>6,295 CFU / m³</p>	 <p>155 CFU / m³</p>
Fungus	 <p>1,135 CFU / m³</p>	 <p>360 CFU / m³</p>
Total:	7,430 CFU / m ³	515 CFU / m ³

Conector macho



Before installation





Return air must go through air purifier.

$V_{\min} = 0.8 \text{ m/s}$





After installation







Present in more than **100 countries**



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