

# Smartcitair™

## Removing pollution from the air we breathe

by Catecar Industries SA

**Catecar Industries SA** is a private limited company incorporated under Swiss law with capital of CHF 200,000, registered in the Swiss Register of Commerce, reference number CH-036.3.048.847-3, dedicated to developing pollution-removing transport and cleaning pollution from the air people breathe. With these aims in view, Catecar:

- designed and developed the first non-polluting/pollution-removing car exhibited at the Geneva Motor Show in March 2017;
- began marketing **Smartcitair™**, the system that removes pollution from ambient air;
- is launching a pollution-removal service for **school classrooms**;
- and the **first personal and portable air pollution remover**

## Smartcitair™

The system that removes PM2.5 + PM1, NO<sub>2</sub>, ozone and hydrocarbons wherever they are concentrated and where people breathe them in

### Air pollution and health

For several years, Catecar Industries SA has been conducting scientific analyses of the concentration and stagnation of pollutants in the **breathable zone**, i.e. in a volume at 0 to 3 m in height, either in built-up areas or on public transport.

The facts speak for themselves:

- a. The breathable zone is the place where heating, pollution and illnesses combine to weaken or destroy the human organism through its primary function: respiration.
- b. Breathable air is contaminated to such an extent that immediate and transitional tangible measures are required, even before the many sources of this pollution are reduced: it must be *removed* to diminish its poisonous effect, particularly on young people.
- c. The principles of viscosity, non-volatility and shearing of the air mean that the volume of air being breathed in is very different from a laminar airflow, but tends to be turbulent, mainly due to physical obstacles that the sheared air encounters (street canyons, cars, walls, corridors, furniture, people, etc.).
- d. The polluted air stratifies itself and is no longer ventilated naturally; it stagnates near the ground.

**American and European studies have shown that the pandemic has been most virulent wherever pollution is greatest. This easy to explain: pollution by ultrafine particles (PM1) penetrates deep into the lungs, just like termites burrow into wood in houses.**

## Catecair™ 101: The first portable, personal pollution-removal device

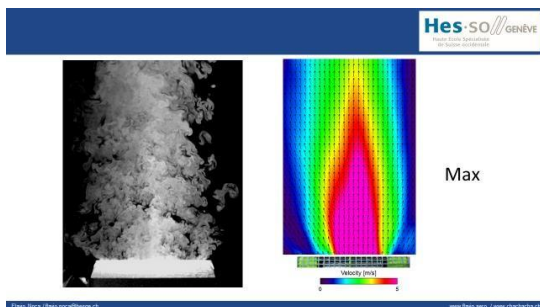
It seems hard to credit that billions of people are wearing masks that make it hard for them to breathe and prevent them from communicating properly with other people any more – masks that have to be thrown away after three hours’ use. Ecology and health are not being properly served. In fact, they are being smothered. It’s not natural for users of public transport to have to breathe extremely polluted air day after day.

Covid-19 has taught us that the more fine-particle pollution there is, the more sick people there are, and that pollution from airborne aerosols is a reality, as 300 scientists stated in a letter to the WHO in early July 2020<sup>1</sup>.

Worn at chest level, the Catecair™ 101 captures fine particles and viral molecules, and pushes 16 m<sup>3</sup> of pollution-free air per hour towards its wearer’s face. Twenty-five times the volume of air that’s breathed in. Wearers thus breathe clean, pollution-free air – that is within the WHO threshold (the strictest standard) – and are protected from the exhalations of people nearby. They also clean the surrounding air, for the benefit of those around them.

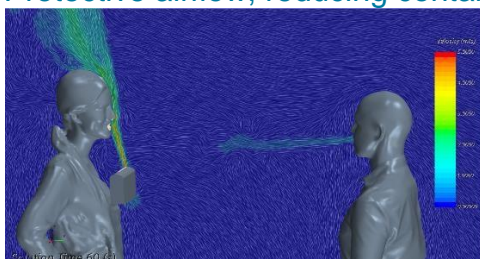
This device will enter production in late 2020.

Dimensions: 170 x 50 x 100 mm. Weight: 380 g.



Catecair™ 101 airflow strength, as measured by the University of Geneva: 4.5 litres/sec.

### Protective airflow, reducing contamination risk **by 99.8%**.



Digital simulations by HBI Haerter AG, Berne, world leader in tunnel ventilation  
<https://www.hbi.ch>

<sup>1</sup> <https://academic.oup.com/cid/article/doi/10.1093/cid/cia939/5867798#.XwVo1LrcPjk.twitter>

### **The first personal air-pollution-removal device working for the economy**

The Catecair™ filter captures  $\geq 95\%$  of PM10,  $\geq 85\%$  of PM2.5 and  $\geq 80\%$  of PM1 (i.e. nanoparticles, viruses and exhaust gases).

The volume of air that passes in front of the face and filtered in 2 seconds (inspiration time) is 9 litres ( $16 \text{ m}^3/\text{hour}$ ), whereas the volume breathed in is 25 times less (0.35 litre/2 seconds). The residual risk of 20%, divided by 25, therefore falls to 0.8%.

Moreover, this 0.8% risk can only apply to a concentration of viral molecules that is **too small to constitute serious contamination**, as the cleaned, pollution-free air is breathed in 1.5 m above the ground. At that height, droplets too heavy to remain there fall to the ground, whereas aerosols rise to above 2 metres. There is, therefore, no major concentration of viral molecules requiring removal in that zone where the air is breathed in.



## School classrooms

Throughout Europe, as in Switzerland, the overwhelming majority of school classrooms are polluted. What is more, the pandemic has made the lockdown of entire classes, indeed whole schools, a daily occurrence, posing serious problems for children.

On the basis of a formula that it has developed, Catecair is offering a system for removing **particulates and viruses** that benefits both schoolchildren/students and their teachers, thanks to the combination of three products: **Catecair™ 40, 70 and 101**.

Thanks to this combined system, both the air breathed in by the teacher and the classroom air in general for the benefit of the pupils are cleaned of pollution by Catecair™ 101 and Catecair™ 70, respectively. This procedure makes it possible to avoid locking down an entire educational institution when a few new cases of sickness appear.

The children hardly ever infect each other and the teacher is protected.

Catecair™ 70: 400 x 200 x 700 mm, 200 m<sup>3</sup>/hour

**Collective protection of pupils in the classroom**

Catecair™ 40: 400 x 200 x 400 mm, 80 m<sup>3</sup>/hour

**Collective protection for toilets**



### PERFORMANCE

A classroom contains a volume of air of approximately 200 m<sup>3</sup> (9 x 8 x 2.7 m). In principle, this air is partly replaced every three-quarters of an hour.

The Catecair™ 70 thus provides integral air treatment, drawing in air at the higher level (above 2 m) where the aerosols are located, and pushing the decontaminated air towards the breathable zone.

The air that the teacher breathes is cleaned of pollution.

The Catecair™ 40 removes pollution in toilets, areas where 25% of the contamination spreads.

All companies with enclosed premises for its staff and/or customers can benefit from this Catecair™ 40/70/101 combination

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### Smartcitair™ Turning cars and street furniture into pollution-removing robots that create breathable air (0-3 metres)

**Smartcitair™ is a network of Catecair™ 120 units.** A Catecair™ 120 filters at least 3500 m<sup>3</sup> of ambient air per day to remove ≥ 80% of its PM10, PM2.5 and PM1 particulates, i.e. a volume of air cleaned of its particulate matter to the benefit of 250 persons (an adult breathes in 12 to 15 m<sup>3</sup> per day).

Catecair™ devices can be fitted **onto the roof of any car** and **onto any street furniture** (bus shelters, Morris columns, advertising hoardings, etc.), thus constituting a *two-fold* combined network, fixed and mobile: Smartcitair™.

Smartcitair™ reduces pollution wherever this is concentrated, and not where it is produced; it thereby improves the quality of breathable air, i.e. the volume of air located between the ground and a height of 3 m. This complies with WHO standards, the world's most stringent.

**Catecair™ 120** thus transforms an ordinary car into a pollution-removing robot.

**A Smartcitair™ network of 4,000 Catecair™ 120 units operating in a town of 100,000 inhabitants produces PM-free air for 1 million people. EVERY DAY.**

**The cost of a network of this kind: CHF 10 million, to bring about a reduction in healthcare costs associated with fine particulates estimated at CHF 500 per person per year, totalling CHF 50 million per 100,000 inhabitants.**



## Filter characteristics

Catecar industries SA has entered into partnership with a German manufacturer of internationally-certified industrial filters, a leading producer of both mobile and static air filtration devices. Its daily production is 20,000 filters a day. This company is also a certified Eco Quality Partner, for both its production and its use of solar energy in its manufacturing processes.

Catecar benefits from exclusive production aimed at removing pollution from ambient city air (both indoor and outdoor). Products carry the Catecair™ brand. The filters are delivered in the dimensions required for fitting inside or on specific locations. In other words, Catecair™ filters can be delivered in any shape or size.

According to the type of filter and pollution level, filters in Europe will need to be replaced every 9 to 18 months (depending on the pollution intensity and the number of hours of operation). Catecair™ filters are classified as common industrial waste (CIW) and require no special treatment. They are incinerated as they cannot be reused.

The filters are tested, certified and validated according to ISO 16890 with absorption  $\geq 80\%$  of PM1, 85% of PM2.5 and 95% of PM10 particulates. With different filters, ozone and hydrocarbon capture is  $\geq 85\%$ . **These results are guaranteed**, as the filters are certified.

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