Photocatalytic filter

Indoor air quality

An innovative device for the sanitisation and purification of the air intended for indoor environments.

RHOSS

NIBE GROUP MEMBER

Air has never been so healthy

An innovative device for sanitisation and purification based on Photocatalysis.

Always attentive to the issues of air quality and at the forefront in the supply of equipment during the pandemic emergency. Rhoss extends its horizons and becomes the leading player of technological and health progress with the introduction of a latest generation device: the Photocatalytic filter.

An effective solution against the infectious load of SARS-Cov2.

Politecnico di Torino

Scientific research

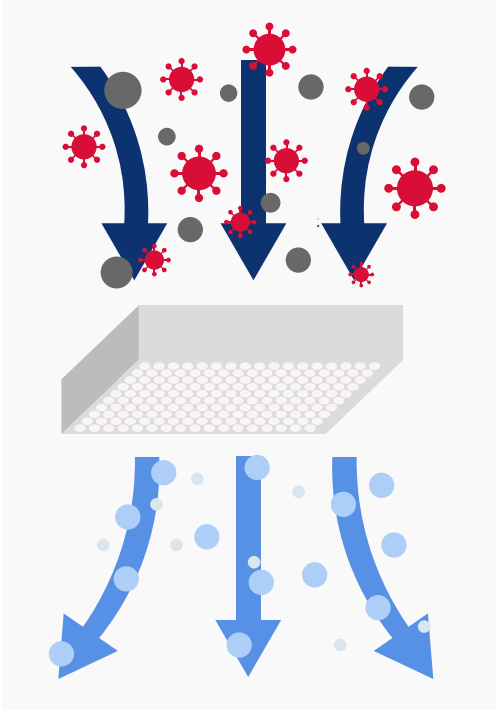
It is an innovative device for the sanitisation and purification of the air intended for indoor rooms, based on the principle of photocatalysis. The joint action of the components sanitises the air, achieving the objectives of containing the transmission of Covid.

Health efficacy

Rapidly and effectively eliminates the main harmful substances present in the air and inactivates the infectious viral load of SARS-Cov-2 indoors.

A unique solution

The application of Photocatalytic filter within the Rhoss air handling units is validated by invaluable collaboration with a team of experts from the Polytechnic Institute of Turin.



Stop to viruses, bacteria, VOC.

A unique solution resulting from scientific research

Effective against Covid-19

Infectious load inactivation of the SARS - Cov-2 virus. Eliminates, bacteria, fungi, odours.

Quick and automatic

Sanitising the air in the room in a few minutes with automatic activation.

Totally safe

100% safe for humans. Inhalation safe, ozone free, UV light free.

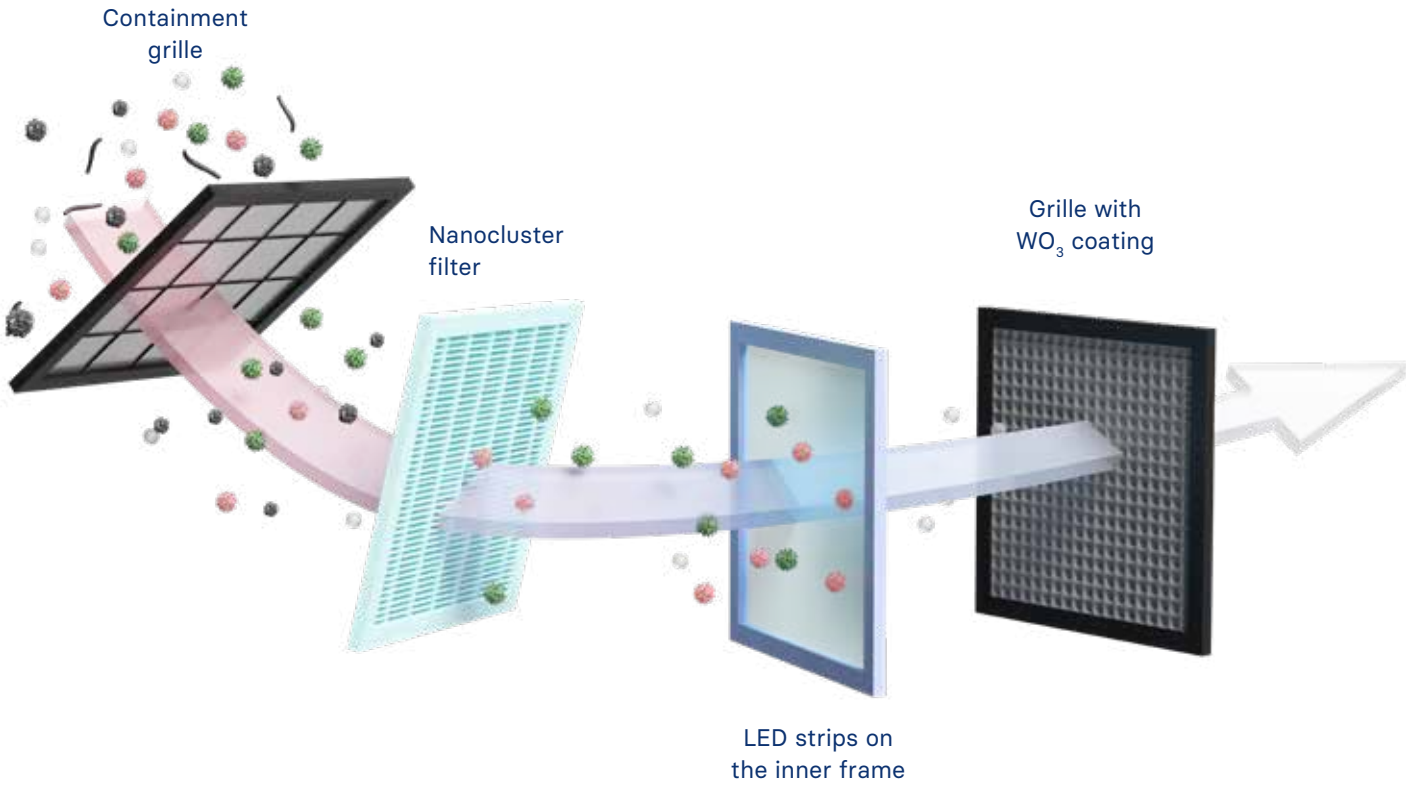
100% ecological

No emissions into the air. No disposal material. Very low operating costs.

No maintenance

The nano coating lasts forever. Easy installation in any unit.

A simple structure concealing high process and material technology integrated in Rhoss units



How works

Photocatalysis is the natural phenomenon whereby a substance, called a photocatalyst, changes the speed of a chemical reaction, through the effects of light (natural or artificial).

The WO_3 tungsten trioxide absorbs the energy of the light and reacts with the water and oxygen in the air to break down harmful substances. The nanocluster filter accelerates this process up to 20 times.

Light source with visible LED light

Activation of the WO_3 Tungsten trioxide photocatalyst

Formation of strongly oxidising species

Destruction and decomposition of pathogenic microorganisms

Formation of water vapour and carbon dioxide

Efficient, safe and sustainable technology

It decomposes harmful substances

The result is the effective decomposition of the main harmful substances present in the air:

- Bacteria
- Fungi
- Mould
- VOC
- Nitrogen oxides
- Odours
- Viruses
- SARS-CoV-2

100% Safe

The device does not require the use of any type of biocidal chemical substance or potentially harmful light sources and can therefore be used in complete operating safety, where people are present.

The photocatalysts do not lose their properties over time, acting only as process activators, they do not bind to pollutants and remain available for new photocatalysis cycles.

Transforms polluting substances

The polluting and toxic substances are transformed, through the photocatalysis process, into harmless elements and measurable in ppm (parts per million):

- Carbon dioxide (CO_2)
- Water vapour (H_2O)
- Sodium nitrate ($NaNO_3$)
- Sodium carbonates (Na_2CO_3)
- Limestone ($CaCO_3$)

Efficient process

It immediately destroys the bacteria and viruses in the air. Instant decomposition of microorganisms 20 times more effective than previous $Ti0_2$ based on NPCO technology.

Continuous process

24/7 with visible white light on, no interruption for extraordinary maintenance.

Economic

Very low operating costs, does not involve any replacement of disposal material and requires minimal maintenance.

Safe process

Safe for humans, 100% compatible and safe with no negative effects for human inhalation, ozone free, UV light free. Tested and proven - Scientific reports.

Clean process

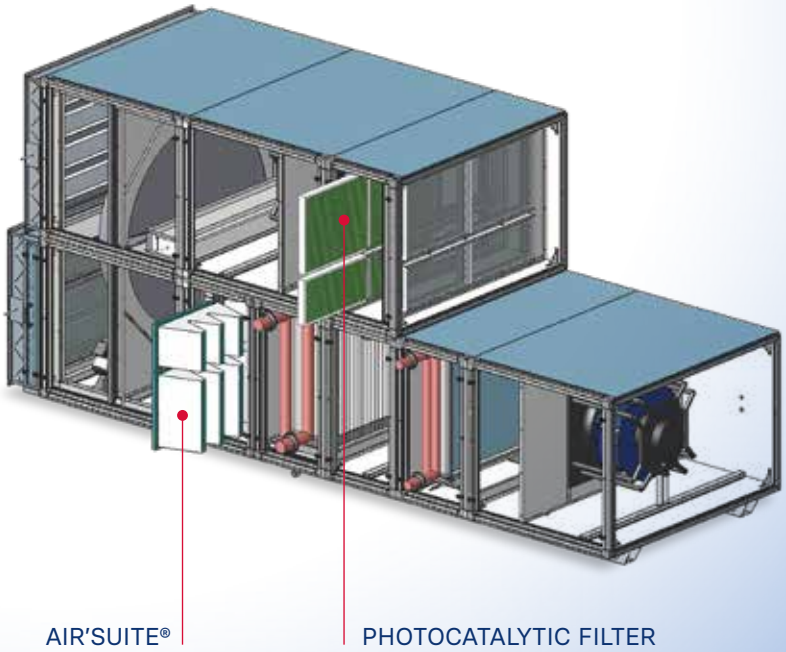
Non-pathogenic residues, only harmless quantities of CO_2 and H2O remain deriving from the photocatalytic reaction.

Sustainable and lasting

The photocatalytic process enabler is a nano coating with eternal life; it does not deteriorate and does not degrade over time.

Exceptional purity levels with Custom ADV and ADV NEXT Air.

The application of the Photocatalytic filter in combination with the Air'Suite® bactericidal filter in the Rhoss air handling units permits the indoor air quality to be raised to exceptional purity levels.



Rhoss's proposal is to position Photocatalytic filter on the return section, with a dual advantage.

Sanitise the surface of the heat recovery

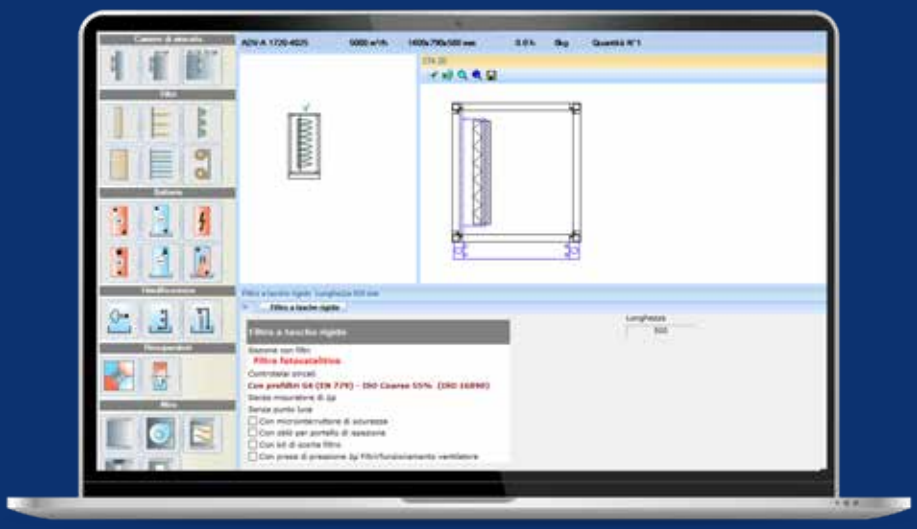
Purify the recirculation air

Prefilter

To ensure the sanitising properties of the Photocatalytic filter for years to come, prefilter installation is recommended downstream.

Available in the filters section

The product is available within the Custom ADV & ADV Next Air selection software and can be easily selected in the rigid bag filters section.



Perfect integration

It integrates perfectly into the architecture of the Rhoss air handling units of the **Custom ADV** and **ADV Next Air** ranges due to its standard dimensions, in line with most of the filter cells available on the market.

CUSTOM ADV

NEXT AIR ADV

40,000 hours duration

The product is practically **eternal**, requiring only the replacement of the LED lights, designed for continuous 40,000 hours of uninterrupted operation.

Very basic periodic maintenance is required during operation, aimed at checking the cleanliness of the metal mesh and the lighting status of the LED lights.

Air management during the pandemic

SARS-CoV-2 infectious particles can remain suspended in the air in the form of **bioaerosol** with a **elevated probability of entering the air conditioning circuit** caused by the movement of people, vehicles, natural and forced air ventilation. Therefore, air conditioning and ventilation systems **may significantly contribute to the mitigation or exacerbation** of the risk of airborne contagion.

The intake of outdoor air dilutes the pathogens, **reducing the average viral load** and therefore the probability of contagion, while recirculation can become a source of risk.

During the pandemic emergency period, the general instructions for the management of the systems were the following, with increase of the healthy environment at the expense of energy saving.

Airborne transmission of the virus

Aerosols remain suspended in the air travelling for long distances.

Droplets containing the virus

● Large ● Small

Long-term unsustainable management:

In terms of energy, these interventions have great impact and are not deemed sustainable in the long-term: from a design perspective (and not an emergency adaptation of existing systems), it will be necessary to adopt equivalent measures to avoid excessive cost management increases. During the pandemic, with the same operating hours, there was an estimated 20% increase in the absorption of the fans, the demand for cooling to the refrigeration units more than doubled and demand for heating power in winter was almost 8 times higher than the project values.

Indoor air quality ↑

Energy efficiency ↓

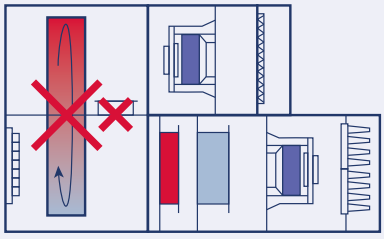
1. **Increase in the air flow rate**
2. **Forcing dampers in outdoor air intake only**
3. **Deactivation or by-pass of the heat recovery unit**
4. **Maintaining the relative humidity set point above 40%**
5. **Continuous operation of outdoor air intake**

Photocatalytic filter brings back energy efficiency

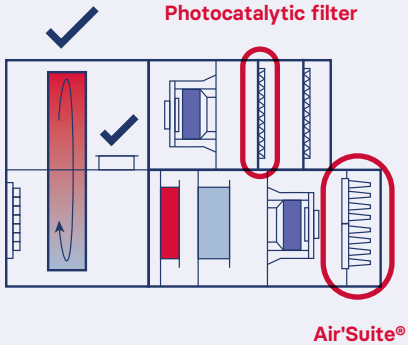
An innovative solution benefitting energy savings

With the use of **Photocatalytic filter** on the return section, combined with the **Air'Suite®** filter on the delivery section, Rhoss offers **a complete and innovative solution** to restore the management of the systems to standard operation benefitting energy savings, ensuring **healthy environments**.

Air management during the pandemic

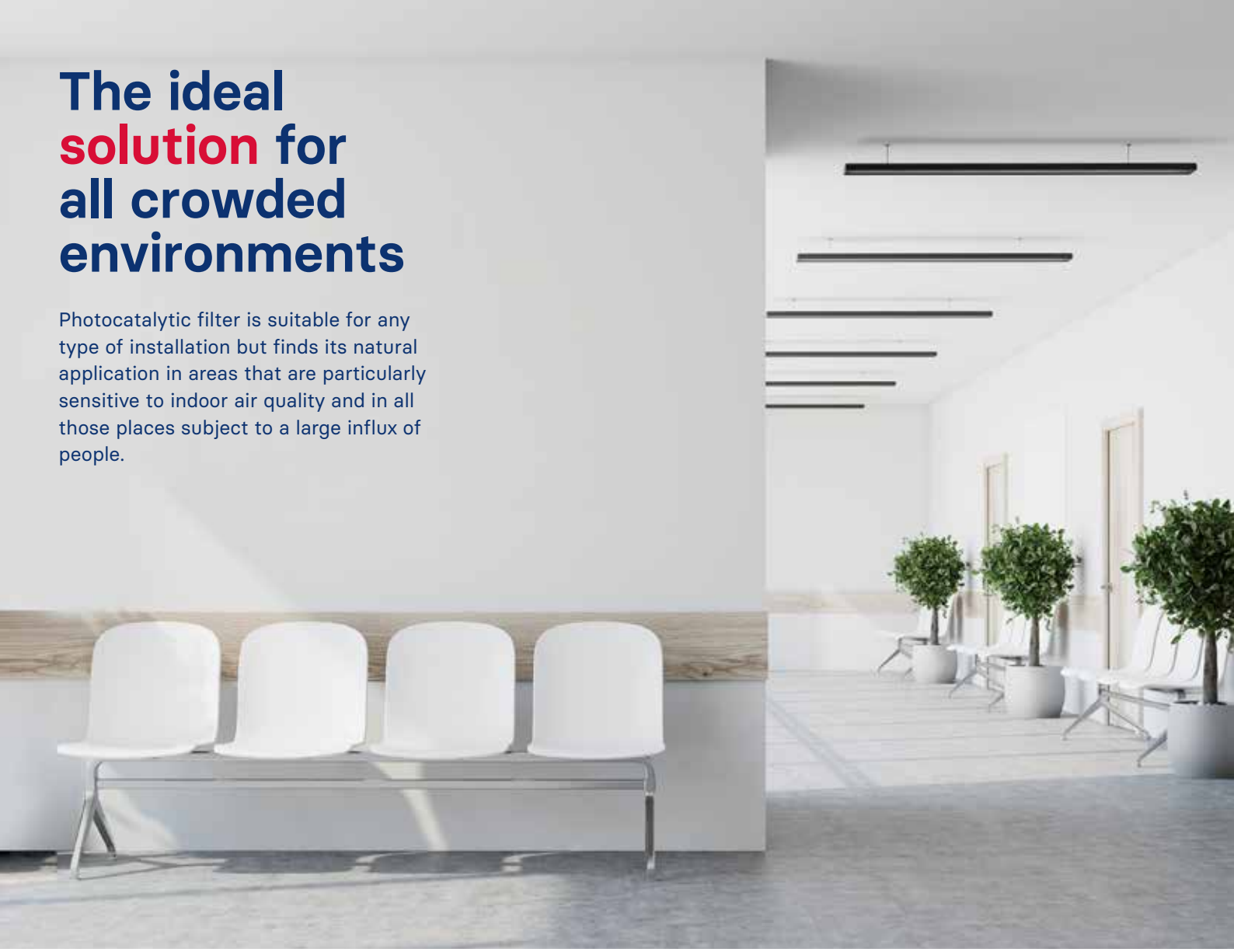


Combined installation of Photocatalytic filter and Air'Suite®



The ideal solution for all crowded environments

Photocatalytic filter is suitable for any type of installation but finds its natural application in areas that are particularly sensitive to indoor air quality and in all those places subject to a large influx of people.



The ideal environment for installing Photocatalytic filter

HOSPITAL

Hospitals, clinics, nursing homes, outpatient clinic waiting rooms

Small rooms with a high density of people, often with illnesses. Reliability and low energy consumption: necessary conditions for continuous operation throughout the year with low costs.

OFFICE

Offices, meeting rooms and conference rooms

An office can be built anywhere, in an ultra-modern building, as in an historic building. Comfort must be ensured for increased working performance and operator safety

ENTERTAINMENT

Cinemas, theatres, shopping centres

Large rooms subject to overcrowding for periods of time, even several hours. The systems must be simple and reliable, and guarantee satisfactory energy savings, with limited return on investment times

And where the health of the environment and the air are of primary importance

HO.RE.CA.

Restaurants, bars, hotels

Gatherings, prolonged stays in restaurants, a large variety of systems in the hotel sector. The demand is for a high level of comfort and health but with an efficient use of energy

WELLNESS & FITNESS

Hot baths, spas, swimming pools, gyms

Large rooms holding a large number of people engaged in physical activity, with an increase in CO2 and humidity. Easily controllable systems are required with the utmost attention to energy saving

SCHOOL

Schools, universities

Many people present in the same place at certain times of the day. Air exchange and mechanical ventilation are essential for comfort and health. Studies show: academic success also depends on the air quality.

Rhoss goes to schools

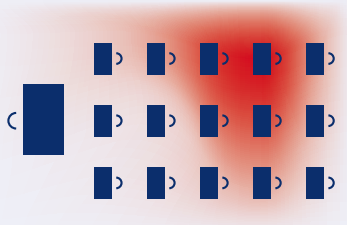
SARS-CoV-2 is transmitted mainly through aerosols, the droplets that we emit when talking and breathing, light enough to float in the air and travel several metres. **Equipping schools with mechanical ventilation systems** is useful beyond SARS-CoV-2: many other respiratory viruses are transmitted via aerosols and others could emerge.

The words of ISS on the management of rooms

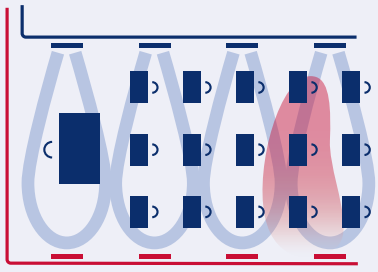
"The new social perception of indoor environments cannot be ignored. The ventilation of indoor environments is of utmost importance. Where natural ventilation is not possible or sufficient, ventilation appliances must be installed. Mechanical ventilation systems are more effective than simply opening windows, and they also improve air quality through filtration."

Source ISS reports no. 55 and no. 9 of 2020

Ventilation guarantees the effect of continuous dilution and restoration of air quality

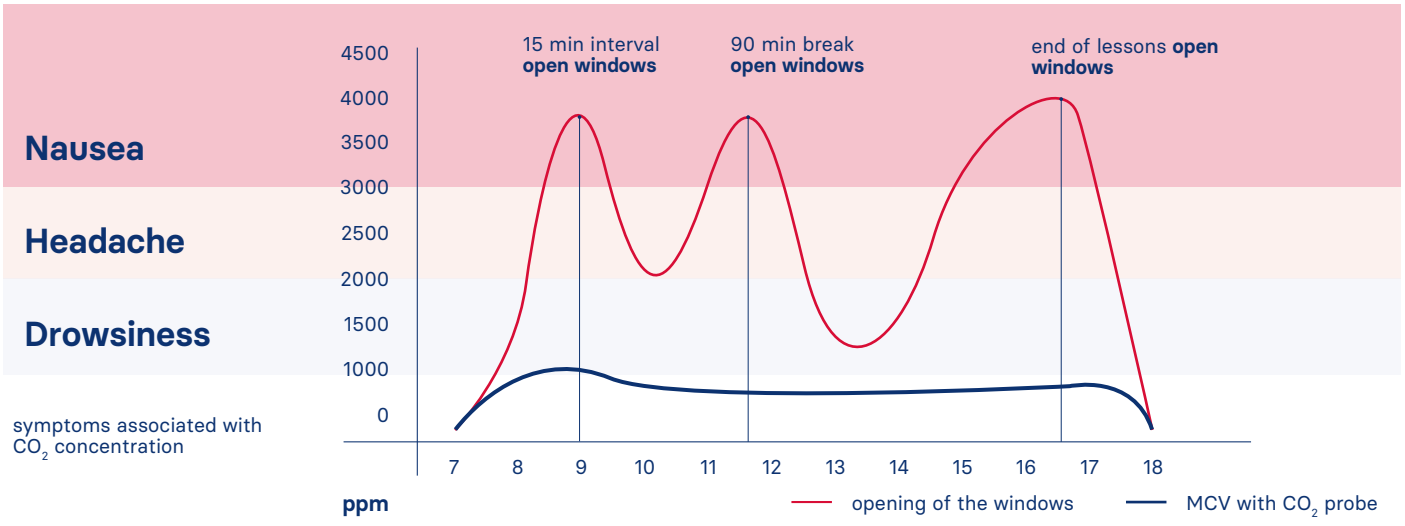


Dynamics of contamination in the presence of an infectious subject without ventilation



Dynamics of contamination in the presence of an infectious subject with ventilation

CO_2 rate on a school day
(Reference standards for air quality EN 13 779)



Solutions for every type of requirement and installation

Custom ADV & ADV Next Air + Photocatalytic filter

New building or undergoing renovations, with the possibility of creating ducts for air distribution.

UTNR-A Platinum + Photocatalytic filter

Existing building, with direct application inside the classrooms.

Case study: classroom

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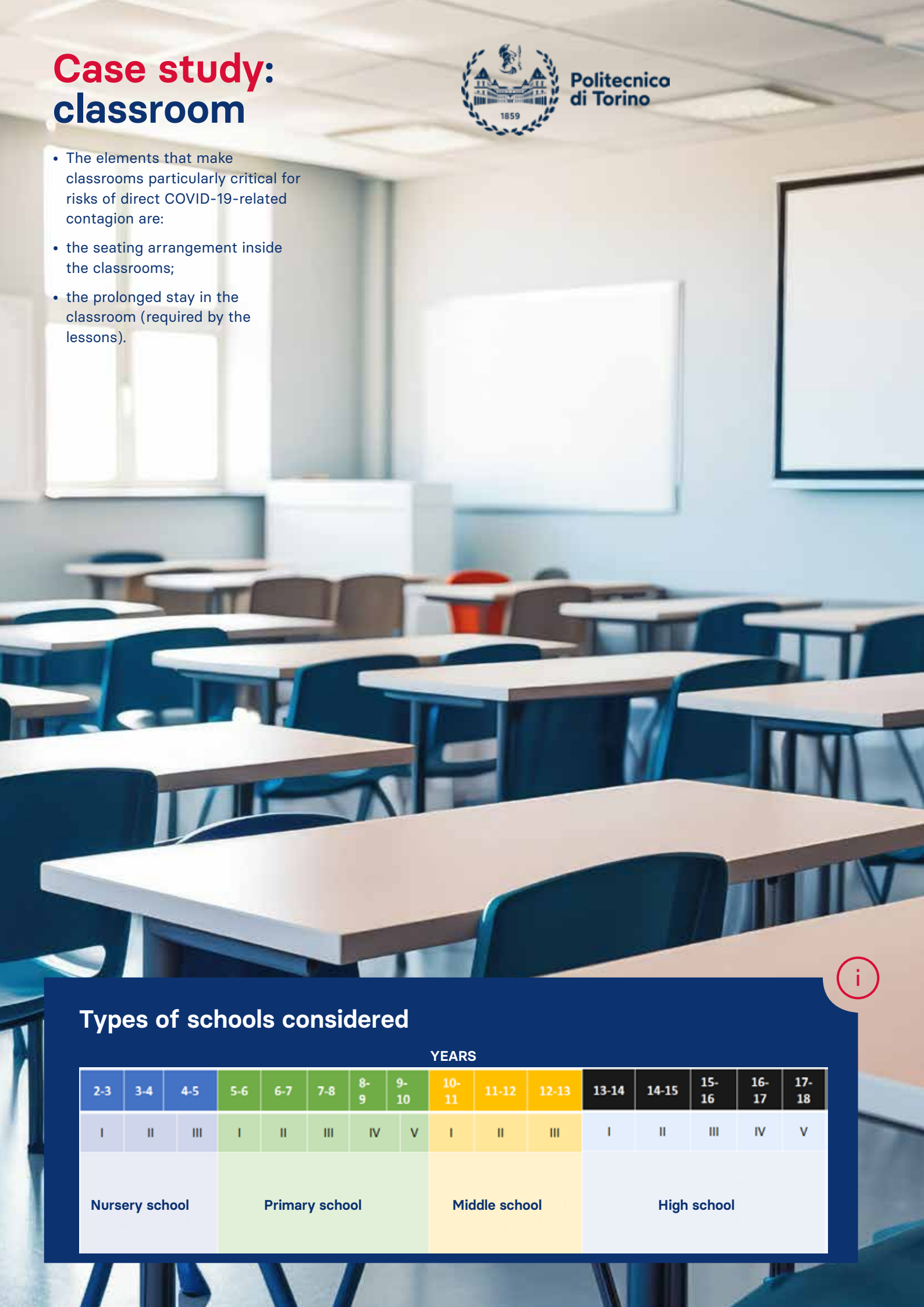
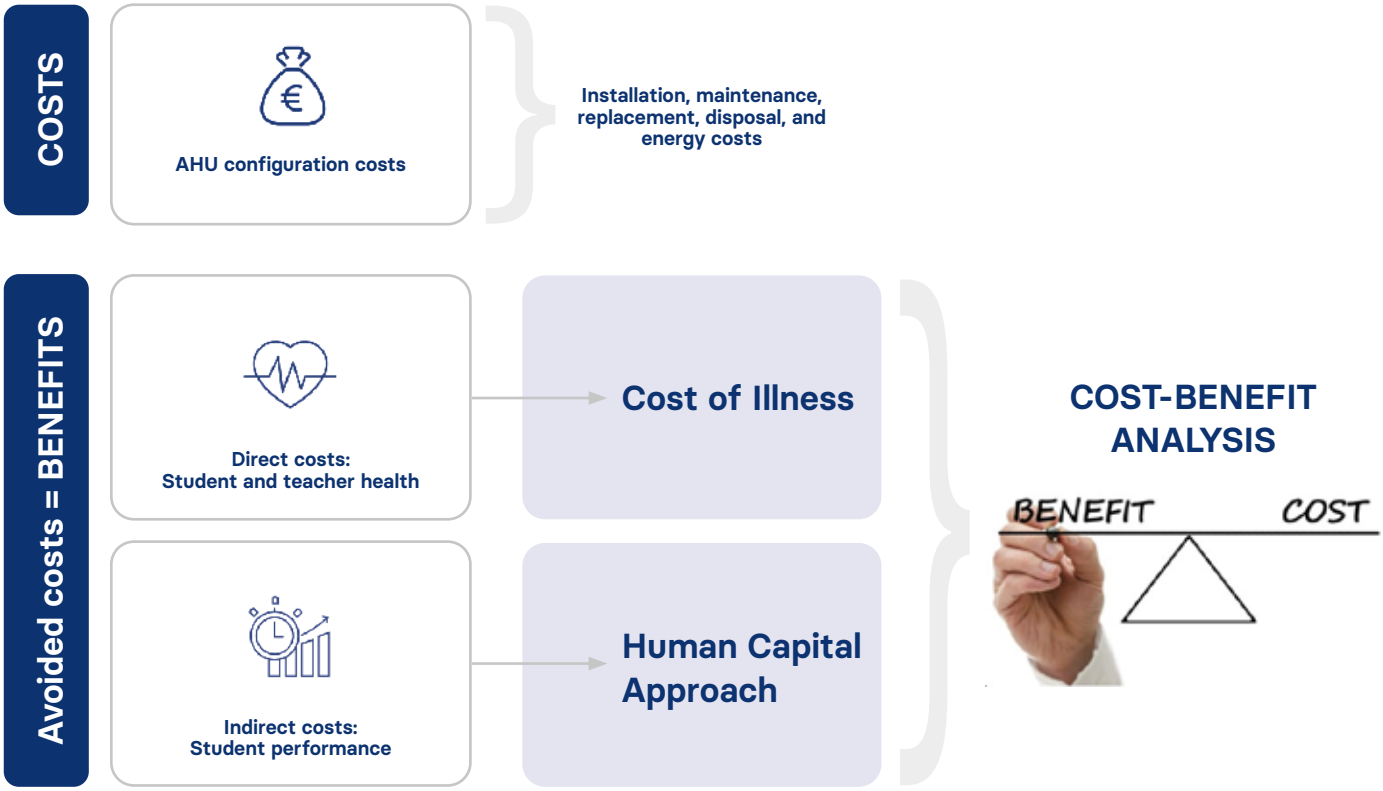
- The elements that make classrooms particularly critical for risks of direct COVID-19-related contagion are:
- the seating arrangement inside the classrooms;
- the prolonged stay in the classroom (required by the lessons).



Types of schools considered

YEARS															
2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18
I	II	III	I	II	III	IV	V	I	II	III	I	II	III	IV	V
Nursery school			Primary school					Middle school			High school				

Cost-Benefit Analysis (CBA)



Post-Covid vs. Pre-Covid

(Photocatalytic filter + Air'Suite® vs. market filter F7)

Health and productivity	Δ Benefits / Δ Costs
Kindergarten (2-3 years)	0,73
Primary School (6-10 years)	8,20
Lower Secondary School (11-13 years)	8,53
Upper Secondary School (14-19 years)	8,59

Post-Covid vs. Covid

(Photocatalytic filter + Air'Suite® vs. market filter F7)

Energy savings	Δ Benefits / Δ Costs
Primary School (6-10 years)	33,38
Upper Secondary School (14-19 years)	32,93

The analysis underlines the unsustainability of energy-intensive HVAC system countermeasures undertaken during the pandemic emergency and supports the need to identify solutions able to provide healthy indoor spaces, whilst reducing the air handling energy impact.

New air
for the future.

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