# CERTIFICATIONS AND TESTS 2021-v0

## PAT³ effectiveness test

**Description:** Test of PAT3 device effectiveness
**Certification body:** Stericheck Consulting S.r.l
**Reference standard:** Demonstrate the effectiveness of PAT3 in comparison with manual professional sanitation in an outpatient setting.
**Operating procedures:** Microbial load measurement taken from an examination room of an orthopaedic clinic. Samples have been taken in various positions during a typical working day with handmade sanitization, and during another typical working day with an automatic sanitation made by PAT3.
**Full report**: doc. n° 13
**Result:** The data obtained confirm a much higher reduction of microbial loads with the use of the triple PAT3 technology compared to a handmade sanitation performed by an operator.

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**Description:** Test of PAT3 dry fog effectiveness in an industrial plant
**Certification body:** Cosmosol
**Reference standard:** Demonstrate the effectiveness of PAT3 sanitization in an industrial complex.
**Operating procedures:** Microbial load measurement taken from n°15 different points inside a manufacturing plant during a typical working day. Microbial load have been evaluated before PAT3 sanitization treatment, after the treatment and after 36 and 84 hours.
**Full report**: doc. n° 18
**Result:** The data obtained confirmed sanitization effectiveness in a 5000 cubic meters industrial manufacturing plant.

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## Sanitization process (dry fog) and sanitizing liquid integrated in the PAT³

**Description:** Certification of the sanitizing liquid effectiveness
**Certification body:** STUDIO AMBIENTE S.r.l.
**Reference standard:** UNI EN 14561 –July 2006; UNI EN 12353 –March 2013
**Operating procedures:** Certified quality management system ISO 9001 and ISO 13485
**Full report:** doc. n° 1
**Result:** Bactericidal effectiveness on surfaces demonstrated against bacterial strains *Pseudomonas aeruginosa*, *Staphylococcus aureus* ed *Enterococcus hirae,* in accordance with the requirements of the European standard UNI EN 14561 – July 2006.

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**Description:** Medical Device Certificate of the sanitizing liquid and the spraying system.
**Certification body:** KIWI CERMET ITALIA S.p.a.
**Reference standard:** Directive 93/42/CEE for medical device class IIa
**Operating procedures:** Certification CE
**Full report**: doc. n° 2
**Result:** Class II a Medical Device - Disinfectant solution for non-invasive medical devices based on peroxide and silver ions and sanitization system.

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**Description:** Validation of the sanitization process by spraying.
**Certification body:** TECNOLAB – Doc. Caterina Serino
**Reference standard:** Dir. 93/42/CEE for medical device class IIa
**Operating procedures:** Effectiveness test foreseen for the two phases of the approval process for disinfectants of class II a medical device.
**Full report**: doc. n° 3
**Result:** The sanitization had positive effects on all the strains tested respecting the times and dispensing methods foreseen by the manufacturer.

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**Description:** Analysis report for mycobactericidal, bactericidal and fungicidal activity.
**Certification body:** University of Foggia – Department of Agricultural, Food and Environmental Sciences (SAFE).
**Reference standard:** EN 13697:2005; EN 14561:2009; EN 14562:2009; EN 14563:2009; EN14348:2005; EN 13704:2005.
**Operating procedures:** Antimicrobial activity tests carried out on 9 different bacteria and 2 different types of fungi in accordance with the requirements of the European standard.
**Full report**: doc. n° 4
**Result:** The sanitizing solution demonstrates bactericidal, fungicidal, mycobactericidal and surface sporicidal effectiveness for *Ent.hirae*, *L. monocytogenes*, *Ps. Aeruginosa*, *Salmonella* sp., *Staph. Aureus*, *M. avium*, *M.terrae*.

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**Description:** Test of the effectiveness of the sanitizing product within 24 hours.
**Certification body:** TECNOLAB – Doc. Caterina Serino
**Reference standard:** Demonstrate that the sanitization system, considering its stability over time, is able to obtain a reduction of the microbial load of $10^5$ in accordance with the reference standard in the established time, and if it is able to maintain his effectiveness during the 24 hours following to the sanitization.
**Operating procedures:** The tests were carried out on two certified strains ATCC: Staphylococcus aureus ATCC 25923 and Enterococcus faecalis ATCC 29212.
**Full report**: doc. n° 5
**Result:** Sanitization with a spray of 6 ml/$m^3$ after a contact time of 15 minutes has positive effects with a reduction of the two strains considered within the reference standard limits. Following an external contamination (introduction of other bacteria within the 24 hours following the end of sanitization) there is still a residual abatement of $10^2$.

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**Description:** Silver ions residual test in the environment.
**Certification body:** Re. Chem. An. s.a.s – Research and Chemical Analysis
**Reference standard:** Demonstrate that the sanitizing solution based on hydrogen peroxide and silver ions does not have a residue greater than the standard limit.
**Operating procedures:** The tests were carried out by sampling silver ions and hydrogen peroxide airborne in the environment before and after the sanitization process at regular intervals.
**Full report**: doc. n° 6
**Result:** It was found that the concentration of silver ions is within the standard limits after 30 min from the end of the process

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**Description:** Virucidal quantitative suspension test for chemical disinfectants and antiseptics in the medical area.
**Certification body:** EUROFINS BIOLAB
**Reference standard:** UNI EN 14476:2019
**Operating procedures:** Standard protocol defined by UNI EN 14476:2019
**Full report**: On request (17)
**Result:** Certified virucidal effect.

## PCO™ technology and ionization integrated in PAT³

**Description:** Study of the active photocatalysis process of titanium dioxide ($TiO_2$) against viruses and bacteria.
**Certification body:** POLITECNICO DI MILANO – Department of Chemistry, Materials and Chemical Engineering "Giulio Natta"
**Reference standard:** Demonstrate that the active photocatalysis process of titanium dioxide ($TiO_2$) is effective against viruses and bacteria.
**Operating procedures:** The tests were carried out on two certified strains ATCC: Staphylococcus aureus ATCC 25923 and Enterococcus faecalis ATCC 29212.
**Full report**: On request (7)
**Result:** Surface photocatalysis on titanium dioxide ($TiO_2$) has a high potential to reduce the transmission of infections in a very limited time of exposure to the reaction.

**Description:** PCO technology effectiveness test on bioaerosol inactivation.
**Certification body:** Airmid Healthgroups – Antimicrobial Laboratories
**Reference standard:** ASHRAE52.2
**Operating procedures:** Bacterial loads abatement test and ionizing activity evaluation on particulate matter.
**Full report**: On request (8)
**Result:** The data obtained confirm the effectiveness of both functions.

**Description:** PCO technology effectiveness test
**Certification body:** MicroLife Lab S.N.C
**Reference standard:** Demonstrate the effectiveness of PCO on the Aspergillus Brasiliensis fungus and on the Legionella Pneumophila bacterium.
**Operating procedures:** Fungus microbial load abatement test Aspergillus Brasiliensis (ATCC 16404) and Legionella Pneumophila (ATCC 33152).
**Full report**: On request (9)
**Result:** After 2 hours of exposure of the sample there is a 91% reduction in the microbial load of the fungus *Aspergillus Brasiliensis* (ATCC 16404) and 98% of *Legionella Pneumophila* (ATCC 33152). After 5 hours of exposure there is a reduction of the microbial load of 100% of the fungus *Aspergillus Brasiliensis* (ATCC 16404) and of 99% of *Legionella Pneumophila* (ATCC 33152).

**Description:** PCO & Ionization technology effectiveness test
**Certification body:** MicroLife Lab S.N.C
**Reference standard:** Demonstrate the effectiveness of PCO and the ionization on the Aspergillus Brasiliensis fungus and on the Legionella Pneumophila bacterium.
**Operating procedures:** Fungus microbial load abatement test Aspergillus Brasiliensis (ATCC 16404) and Legionella Pneumophila (ATCC 33152).
**Full report**: On request (10)
**Result:** After 3 hours from the exposure of the sample there is a 100% reduction of the microbial load of the fungus *Aspergillus Brasiliensis* (ATCC 16404) and of 98% of *Legionella Pneumophila* (ATCC 33152).

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**Description:** Microbicidal capacity test of the PCO with double ionization on different microorganisms.
**Certification body:** University of Salerno – Department of Industrial Engineering
**Reference standard:** Demonstrate the microbicidal effectiveness of PCO with double ionization on microorganisms such as: bacteria, yeasts and molds and on the microbial load present in the air.
**Operating procedures:** Tests were carried out on the bacterium Escherichia Coli (DH5α) and on two fungal forms Saccharomyces cerevisiae (168/9) and Aspergillus niger (ATCC 3642).
**Full report**: On request (11)
**Result:** After 24 hours of exposure to air treated with the PCO system, the microbial load on the sample is about 100 times (log 2) lower than the sample left in the same environment without the presence of the PCO technology. Tests conducted on colonies of *Escherichia Coli* (DH5α) shows that after 4 hours of treatment there is an almost total reduction of the microbial load.

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**Description:** Action simulation of PCO technology inside a local office
**Certification body:** University of Salerno – Department of Industrial Engineering
**Reference standard:** Demonstrate the antimicrobial effectiveness of PCO installed on a fan coil on microorganisms such as: bacteria, yeasts and molds and on the microbial load present in the air.
**Operating procedures:** The tests were performed on bacterial colonies, molds and yeasts.
**Full report**: On request (12)
**Result:** The tests show that the PCO technology has significantly limited the growth of airborne microorganisms present in the environment under investigation on LB, PCA and YPD culture media.

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**Description:** Test on the ozone emission in the environment by PCO technology.
**Certification body:** Antimicrobial Test Laboratories
**Reference standard:** Demonstrate the correct ozone emission within the standard limits.
**Operating procedures:** The tests were conducted using the ozone quantity control device: 49C Ozone Analyzer.
**Full report**: On request (14)
**Result:** The tests confirm an emission within regular limits of the amount of ozone in the environment.

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**Description:** Test on SARS-CoV-2
**Certification body:** Milan Sacco Hospital Test Laboratories
**Reference standard:** Demonstrate virucidal effectiveness of PCO process against SARS-CoV-2.
**Operating procedures:** The tests have been carried using SARS-CoV-2 viral charge on a surface and a textile. The two samples have been placed in a test room with PCO for 20 minutes and viral decay on samples has been compared with natural virus decay.
**Full report**: On request (15)
**Result:** The tests confirm a virucidal effect Log2,5 (99,7%) in 20 minutes.

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**Description:** Chemical disinfectants and antiseptics. Methods of airborne room disinfection by automated process. Determination of bactericidal, mycobactericidal, sporicidal, fungicidal, yeasticidal, virucidal and phagocidal activities

**Certification body:** EUROFINS BIOLAB
**Reference standard:** EN 17272:2020
**Operating procedures:** According test conditions described in EN 17272:2020
**Full report**: On request (16)
**Result:** Reduction of viable cells from 92% to 95%.

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