DECLARATION OF VERIFICATION
ETV – Environmental Technology Verification

Company	Natéo Santé	Registration No.	180155-DV FR
Technology	EOLIS Air Manager 1200	Date of issue	15/10/2018

Product description

The EOLIS Air Manager 1200 air purifier is an electrical device designed to control the quality of indoor air and to reduce pollution in indoor spaces related to the presence in the air of different types of pollutants (suspended particles, volatile organic compounds (VOCs), microorganisms and allergens).

The EOLIS Air Manager 1200 air purifier is used in a room, preferably opposite an air inlet (mechanical ventilation, door or window). When it is turned on, polluted air is drawn into the front of the unit and through the entire filtration system. The polluted air is filtered and then propelled out on the top of the unit (behind the screen), to clean the air inside the room.

Parameters verified

The following parameters were measured and verified during this verification:

Operating parameters (Table 1):

- the air flow;
- the A-weighted sound power level;
- the absorbed electrical power;

Performance parameters:

- Device safety evaluation: Monitoring of the absence of particle emissions (Table 2)
- Evaluation of performance with respect to inert particles (Table 3)
- Device safety evaluation: Monitoring of the absence of emission by-products (Table 4)
- Evaluation of performance with respect to Volatile Organic Compounds (VOCs) (Tables 5, 6 and 7)
- Evaluation of performance with respect to microorganisms and allergens (Tables 8, 9 and 10)
- Evaluation of performance with respect to Volatile Organic Compounds (VOCs), recirculation test (Tables 11, 12 and 13)

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Table 1: Operating parameters depending on the speed of the purifier and its operating mode: air flow, A-weighted sound power level and absorbed electrical power

Operating parameters	**Minimum speed V2**		**Maximum speed V5**	
Photocatalysis function	**Not activated**	**Activated**	**Not activated**	**Activated**
Air flow (m^3/h)	53		138	
A-weighted sound power level (dB)	-	43.4 ± 1.2	-	61.8 ± 1.0
Absorbed electrical power (W)	20.5	42.7	51.4	73.5

Note: Measurement uncertainty less than 5% for air flow. Normative uncertainty related to the spectrum K = 2 for the A-weighted sound power level.

Table 2: Purifier safety - Monitoring of the absence of particle emissions

Settings	**Average difference between the number of particles upstream and downstream with air circulation free of VOCs and particles***	
Speed	**maximum V5**	
Photocatalysis function	**Activated**	
Particle size range	**Value**	**Standard deviation**
0.2 – 0.3 µm	15	6
0.3 – 0.5 µm	37	11
0.5 – 0.7 µm	15	6
0.7 – 1 µm	11	4
1 – 2 µm	16	4
2 – 3 µm	4	3
3 – 5 µm	4	3

Note: Measurement uncertainty less than 2%. No significant increase in the number of $PM_{2.5}$ particles was observed during this test.
** : Stated in number based on an air volume of 14.2L*

Table 3: Purification efficiency and purified air flow with respect to particles

Settings	**Purification efficiency (%)**		**Purified air flow (m^3/h)**	
Photocatalysis function	**Not activated**		**Not activated**	
Speed	**minimum V2**	**maximum V5**	**minimum V2**	**maximum V5**
Particle size range				
0.2 – 0.3 µm	73.6	81.9	39	113
0.3 – 0.5 µm	73.6	82.6	39	114
0.5 – 0.7 µm	75.5	84.1	40	116
0.7 – 1 µm	75.5	84.8	40	117
1 – 2 µm	77.4	86.2	41	119
2 – 3 µm	77.4	88.4	41	122
3 – 5 µm	81.1	92.0	43	127

Note: Measurement uncertainty less than 2%.

Table 4: Purifier safety - monitoring of the absence of emission by-products: differences in concentration between the downstream and upstream measurements of the purifier without adding pollutants for the maximum speed V5

Compounds	**Difference in concentration of emissions by-products** $C^X_{aval} - C^X_{amont}$		**LQ**	**Maximum acceptable concentration difference**	**Measurement uncertainty**
Photocatalysis function	**Not activated**	**Activated**			
Ozone (ppbv)	<LQ	<LQ	20	≤10 µg/m^3 Or ≤5.1 ppb	-
Formaldehyde (ppbv)	-1.8	-1.4	4.5	≤15 µg/m^3 Or ≤12.3 ppb	20%
Aldehydes/Ketones (ppbv):				≤15 µg/m^3	
- Acetaldehyde	-1.2	-0.2	3.1		
- Acrolein	<LQ	<LQ	2.4		
- Acetone	-2.5	+0.4	2.3		
- Propionaldehyde	<LQ	<LQ	2.3		
- Crotonaldehyde	<LQ	<LQ	1.9		
- Butyraldehyde	<LQ	<LQ	1.9		
- Benzaldehyde	<LQ	<LQ	1.3		
- Isopentanal	<LQ	<LQ	1.6		
- Pentanal	<LQ	<LQ	1.6		
- Hexanal	<LQ	<LQ	1.3		
VOCs (ppbv):			0.04	n.a.	30%
- Toluene	-0.36	-0.18			
- Heptane	<0.05	<LQ			
- Ethanol	+0.90	-6.22			
- Tetramethyl silicate	-0.20	-0.11			
- Heptane, 3-methylene-	-0.20	+0.13			
- Acetic acid	+1.07	-0.28			
- Limonene	<0.13	-0.23			
- Cyclohexane, isocyanate-	+0.24	-0.17			
- 1-Hexanol, 2-ethyl-	0	+0.20			
Carbon monoxide (ppm)	Average: -0.1 Standard deviation: 0.3	Average: -0.3 Standard deviation: 0.4	0.1	≤4.4 ppmv	-
Nitric oxide (ppbv)	Average: - 3 Standard deviation: 8	Average: +2 Standard deviation: 3	1	≤4.1 ppbv	-
Nitric oxide (ppbv)	Average: - 36 Standard deviation: 3	Average: -24 Standard deviation: 3	1	≤5 ppbv	-

Note: Negative concentration differences mean that the downstream concentration is lower than the upstream concentration.

Table 5: Purification efficiency and purified air flow with respect to Volatile Organic Compounds for a flow of 122m³/h (Max. speed V5)

Settings	**Purification efficiency (%)**					**Purified air flow (m³/h)**	
Photocatalysis function	Not activated		Activated			Not activated	Activated
Compounds	Average	Standard deviation	Average	Standard deviation	Uncertainty	Average	Average
Acetone	43	5	52	6	20%	52	63
Acetaldehyde	34	6	48	11	20%	42	59
Heptane	76	9	93	1	30%	93	113
Toluene	71	5	85	2	30%	87	103
Formaldehyde	Statistically insignificant	-	Statistically insignificant	-	30%	Statistically insignificant	Statistically insignificant

Note: Averages were calculated with 3 values.

Table 6: Concentration difference between the emission by-products downstream of the purifier with added pollutants and without added pollutants for a flow rate of 122m³/h (Max. speed V5)

Compounds	**Difference in concentration of emissions by-products** $C^X_{aval\ avec\ polluants} - C^X_{aval\ sans\ polluant}$		**LQ**
Photocatalysis function	**Not activated**	**Activated**	
Ozone (ppbv)	<LQ	<LQ	20
Formaldehyde [1,2] (ppbv)	Average: +8.9 Standard deviation: 0.9	Average: +2.8 Standard deviation: 1.2	4.5
Aldehydes/Ketones (ppbv):			
- Acrolein	<LQ	<LQ	2.4
- Propionaldehyde	<LQ	<LQ	2.3
- Crotonaldehyde	<LQ	<LQ	1.9
- Butyraldehyde	<LQ	<LQ	1.9
- Benzaldehyde	<LQ	<LQ	1.3
- Isopentanal	<LQ	<LQ	1.6
- Pentanal	<LQ	<LQ	1.6
- Hexanal	<LQ	<LQ	1.3
VOCs (ppbv):			
- Ethanol[2]	n.m.	Average: +16.2 Standard deviation: 4.8	0.04
- Tetramethyl silicate[2]	n.m.	Average: +4.7 Standard deviation: 1.2	
- Limonene	n.m.	Average: <LQ	
- Cyclohexane, isocyanate-	n.m.	Average: <LQ	

Note: n.m. : not measured by the laboratory. Averages were calculated with 3 values. 1: Formaldehyde was not one of the pollutants injected during this test. 2: Concentration of upstream emission by-products without adding pollutants: With photocatalysis not activated: Formaldehyde (ppbv) = 7.7; With activated photocatalysis: Formaldehyde (ppbv) = 7.9; *Ethanol (ppbv) = 14.9; Tetramethyl silicate (ppbv) = 0.26.*

Table 7: Concentration difference between the emission by-products downstream and upstream of the purifier with added pollutants for a flow rate of 122m³/h (Max. speed V5)

Compounds	**Difference in concentration of emissions by-products** $C^{X}_{\text{aval avec polluants}} - C^{X}_{\text{amont avec polluant}}$		**LQ**
Photocatalysis function	**Not activated**	**Activated**	
Carbon monoxide (ppmv)	Average: - 0.5 Standard deviation: 0.5	Average: +0.8 Standard deviation: 0.5	0.1
Nitric oxide (ppbv)	Average: <LQ	Average: <LQ	1
Nitric oxide (ppbv)	Average: 0 Standard deviation: +1.4	Average: -1.8 Standard deviation: +0.7	1

Note: Averages were calculated with 3 values.

Table 8: Purification efficiency and air flow with respect to microorganisms for a flow rate of 122m³/h (Max. speed V5)

Settings	**Purification efficiency (%)**		**Purified air flow (m^3/h)**
Photocatalysis function	Activated		
Type of microorganisms	Average	Standard deviation	
Staphylococcus epidermidis	90	3	110
Aspergillus brasiliensis	96	2	117

Note: The average was calculated on 23 values for staphylococcus epidermidis and on 25 values for aspergillus brasiliensis

Table 9: Purification efficiency and air flow with respect to microorganisms for a flow rate of 122m³/h (Max. speed V5)

Settings	**Purification efficiency (%)**		**Purified air flow (m^3/h)**
Photocatalysis function	Not activated		
Type of microorganisms	Average	Standard deviation	
Staphylococcus epidermidis	85	2	104
Aspergillus brasiliensis	96	2	117

Note: The average was calculated on 5 values for staphylococcus epidermidis and on 5 values for aspergillus brasiliensis

Table 10: Purification efficiency and air flow with respect to allergens for a flow rate of 122m³/h (Max. speed V5)

Settings	**Purification efficiency (%)**		**Purified air flow (m^3/h)**
Photocatalysis function	Activated		
Type of allergens	Average	Standard deviation	
Felis domesticus 1	36	9	44

Note: The average was calculated with 3 values.

Table 11: Concentration of emission by-products without pollutant injection for maximum purifier speed V5 (NF EN 16846-1)

Compounds	**Concentration of emission by-products (ppbv)** $C^{X}_{\text{sans polluant}}$	**LQ** (ppbv)
Photocatalysis function	**Activated**	
Ozone[1]	ND	0.2 ppmv
Benzene[2]	<0.4	0.4
n-Heptane[2]	<0.4	0.4
Toluene[2]	<0.4	0.4
Formaldehyde[3]	5	0.8
Acetaldehyde[3]	5	0.5
Acetone[3]	3	0.4
Acrolein[3]	ND	0.4
Propionaldehyde[3]	ND	0.4
Crotonaldehyde[3]	ND	0.3
Butyraldehyde[3]	ND	0.3
Benzaldehyde[3]	ND	0.2
Isovaleraldehyde[3]	ND	0.3
Valeraldehyde[3]	ND	0.3
o-tolualdehyde[3]	ND	0.2
m+p-tolualdehyde[3]	ND	0.2
Hexaldehyde[3]	ND	0.2
2,5 dimethylbenzaldehyde[3]	ND	0.2

Note: ND: not detected. 1: portable Gasalert Micro 5 analyser from BW.2: results obtained by sampling on Tenax cartridges (calibrated against toluene). 3: result obtained by sampling on DNPH cartridges.

Table 12: Clean air delivery rate or CADR with respect to Volatile Organic Compounds for maximum speed V5

Compounds	Clean air delivery rate m^3/h (average)	Standard deviation
Photocatalysis function	**Activated**	
Acetone	29	3
Acetaldehyde	11	4
Heptane	42	2
Toluene	51	2
Formaldehyde	26	6
Benzene	22	3
Sum of VOCs	**39**	**2**

Note: Averages were calculated for 5 injections.

Table 13: Difference between the concentration of emission by-products with pollutant injection and without pollutant during CADR tests for maximum speed V5

Compounds	**Difference in concentration of emission by-products (ppbv)** $\lvert C^X_{avec\ polluants} - C^X_{sans\ polluant} \rvert$	**LQ** (ppbv)
Photocatalysis function	**Activated**	
Acrolein	ND	0.4
Propionaldehyde	ND	0.4
Crotonaldehyde	ND	0.3
Butyraldehyde	ND	0.3
Benzaldehyde	ND	0.2
Isovaleraldehyde	ND	0.3
Valeraldehyde	ND	0.3
o-tolualdehyde	ND	0.2
m+p-tolualdehyde	ND	0.2
Hexaldehyde	ND	0.2
2,5 dimethylbenzaldehyde	ND	0.2

Note: ND: not detected

Application

The Eolis Air Manager 1200 air purifier is used for indoor air treatment.
The matrix targeted by the EOLIS Air Manager 1200 purifier is indoor air in homes, offices and other professional environments, including specific pollution.

Test and analysis design

No existing data was used. All of the tests were carried out as part of the verification by 3 different laboratories.

The CETIAT laboratory in Villeurbanne carried out the tests according to standard NF B44-200 for determining the parameters listed below:

- Power consumption (Wattmeter)
- Sound power (NF EN ISO 3741)
- Flow measurement (NF EN 779)
- Evaluation of purifier safety by monitoring the absence of particle emissions Particulate counting (NF EN 779)
- Measurement of purification efficiency and purified air flow with respect to particles by particle counting

The TERA ENVIRONNEMENT laboratory in Crolles carried out tests according to the B44-200 standard for:

- Determining purifier safety (presence of emission by-products without adding pollutants), purification efficiency and purified air flow with respect to gases as well as the presence of emission by-products when pollutants are added through the following measurements:
  - Measurement of Volatile Organic Compounds (VOCs) by ATD/GC/MS (NF EN ISO 16017-1)
  - Measurement of aldehydes by DNPH - HPLC (NF X 43-264 / Metropol 001 / ISO 16000-3.
  - Measurement of formaldehyde by DNPH - HPLC/UV (ISO 16000-3).
  - Measurement of carbon monoxide, carbon dioxide by Environnement SA and Profil'Air online analysers, nitrogen oxide, nitrogen dioxide continuously monitored by an Environnement SA chemiluminescence analyser and ozone continuously monitored with an Environnement SA UV photometry analyser.
- Purification efficiency and purified air flow with respect to microorganisms and cat allergens by means of the following measurements:
  - The measurement of microorganisms (bacteria and fungi). This test was subcontracted to the Air & Bio laboratory. This company is audited every two years for NF 536 certification.
  - The measurement of cat allergens. This test was subcontracted to Strasbourg hospitals.

The CERTECH laboratory in Seneffe, Belgium, carried out the tests according to standard NF EN 16846-1, which replaces standard AFNOR XP B44-013 for:

- Determining purifier safety (presence of emission by-products without adding pollutants), clean air delivery rate or CADR (Clean Air Delivery Rate) with respect to gases and the presence of emission by-products when pollutants are added through the following measurements:
  - Measurement of Volatile Organic Compounds (VOCs and emission by-products) by adsorption on specific Tenax cartridges and analysed by ATD/GC/MS
  - Aldehyde measurement by DNPH - HPLC/UV
  - Measurement of benzene, formaldehyde, acetaldehyde, acetone, n-heptane and toluene by IMR-MS (Ion-Molecule Reaction mass spectrometer)
  - Carbon dioxide measurement by µ-GC-TCD

Additional information*

No additional information was provided by Natéo Santé.

** This information has been declared by the company but has not been verified by the Rescoll Verification Body*

Quality assurance and deviations

The verification was carried out according to the quality assurance plan described in the verification protocol.

Furthermore, RESCOLL applies all ISO 17020 requirements and all GVP requirements during its ETV verifications.

Seven deviations from the specific verification protocol were observed (see verification report). These deviations do not affect the calculation of performance parameters.

None of these deviations were considered to have a significant impact on the verification.

All verification details are recorded in the verification report available on request from Natéo Santé.