Test Certificate

on Test for measurement of particle degradation ratio
of Air purifier TD1866
prepared for ATNS GROUP,Inc.

Note: 1. The results contained herein apply only to the particular specimens tested and to the specific tests carried out, as detailed in this test report.)
2. Only the original report is guaranteed.)
3. No extract, abridgement or abstraction from this test report can be used to institute legal proceedings and to advertise without the written consent of the corresponding technical manager.)

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Test Certificate

KIMM KOREA INSTITUTE OF MACHINERY & MATERIALS	Page(2) / Total Pages(7)	

1	Name of Test	Test for measurement of particle degradation ratio	
2	Name and Address of Client	LEE WOO HUN 5th Floor, Samheung Bldg. 1451-79, Seocho-dong, Seocho-gu, Seoul, Republic of Korea	
3	Name and Address of Maker	ATNS GROUP,Inc. 5th Floor, Samheung Bldg. 1451-79, Seocho-dong, Seocho-gu, Seoul, Republic of Korea	
4	Test Specimen	1) Name/Model	Air Purifier / TD1866
		2) Specification	
5	Test Method	According to SPS-KACA 002-132	
6	Test Date	2014. 02. 24 ~ 2014. 02. 27	
7	Test Environment	Refer to the test report	
8	Test Results	Refer to the test report	
9	Issue Date	2014.02.28	
10	Report No.	KIMM-14-0167	
11	Use of Report	To test the performance of the sample	
12	Tested and Reported by : Lee, Bongwoo	Reviewed and Approved by : Yu Ji Hwa	

2014. 02. 28.

Korea Institute of Machinery & Materials

Test Results

1. Objective

This test is performed to measure the performance of the test specimen for air cleaning capacity on the applied standard, SPS-KACA 002-132 (Korean Air Clean Associate Standard)

2. Test Specimen and Instruments

- Test Specimen : Air purifiers TD1866 of the ATNS GROUP,Inc. - Fig. 1
- Instruments : A chamber for the air cleaning capacity test (30.4 m^3), An optical particle counter (Particle Aerosol Spectrometer, Model 1.109, Grimm Instrument co., Germany), SMPS (Scanning mobility particle sizer, DMA model 3081, Classifier model 3080, CPC 3022A, TSI, USA), An atomizer (Model 3076, TSI, USA)
- Test particle : 0.1 μm KCl particles

Fig. 1 Test specimens

3. Test method and condition

The measuring test for the specimen is air cleaning capacity test. The following shows the test standard for the test item.

○ The particle degradation ratio : Refer to the appendix 1 (clause 4) of SPS-KACA 002-132

Table 1 Test conditions

Test type	Temperature (℃)	Relative Humidity (%)
Particle degradation ratio	24 ± 2	48 ± 5

* The flow rate of the specimen was less than 1 m^3/min. So four specimens were used for the test.

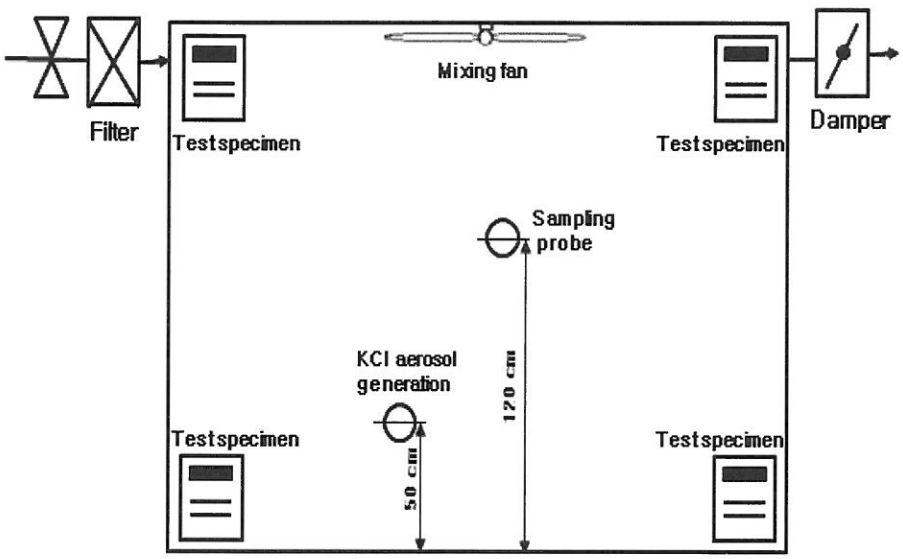

Fig 2. Experimental setup of air cleaning capacity test

4. Test Results

○ The particle degradation ratio was calculated according to the following equation

$$\eta_t = \left(1 - \frac{C_{R,t}}{C_I}\right) \times 100$$

η_t : Particle removal efficiency at t (min) (%)

$C_{R,t}$: Residual concentration of particles after t (min) (particles/cm^3)

C_I : Initial concentration of particles at t=0 (particles/cm^3)

Tabe 2 and Fig 3 show the results of the test.

Table 2. Particle degradation ratio as a function of time (min) for TD1866 model (0.1 μm)

(* Result of the operation of four specimens)

Time (min)	Particle concentration (#/cm^3)	Particle degradation ratio (%)	Note
0	8.88.E+04	0.00	- Particle degradation ratio was measured according to client's demand.
9	6.14.E+04	28.54	
18	3.95.E+04	54.07	
27	3.14.E+04	63.48	
36	2.47.E+04	71.28	
45	2.02.E+04	76.51	
54	1.77.E+04	79.37	
63	1.36.E+04	84.17	
72	1.26.E+04	85.29	
81	9.75.E+03	88.66	
90	9.03.E+03	89.49	
99	8.20.E+03	90.46	
108	7.23.E+03	91.59	
117	6.41.E+03	92.55	
126	4.76.E+03	94.46	
135	3.74.E+03	95.65	
144	3.71.E+03	95.68	
153	3.29.E+03	96.18	
162	3.21.E+03	96.27	
171	2.30.E+03	97.32	
180	1.82.E+03	97.88	
189	2.48.E+03	97.11	
198	2.00.E+03	97.67	
207	1.39.E+03	98.38	
216	1.18.E+03	98.63	
225	1.41.E+03	98.36	
234	7.52.E+02	99.13	
243	1.12.E+03	98.69	
252	3.75.E+02	99.56	
261	6.92.E+02	99.20	

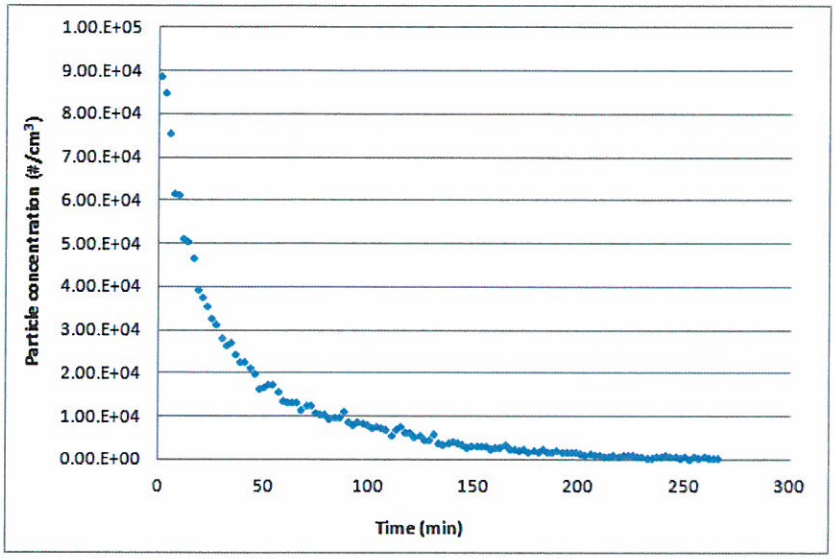

Fig.3 Particle concentration curve as a function of time (min) for TD1866 model (0.1 μm)

(* Result of the operation of four specimens)