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 Arpack GmbH
 Attn: Herr Steve Hornauer
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Braunschweig, 01.11.2021

Test report No. MAIC-2021-2947

Customer: Arpack GmbH, Berlin.

Sample description:

WKI no.	Date of reception	Sample Name <small>(this information is provided by the customer)</small>	Product No.	Manufacturer-Code	Date-Stamp
P89825	02.09.2021	ArpackAirClean VR 600	n.a.	n.a.	n.a.

(Sample P89825: paper/cardboard/wrapped separately, wrapping ok;)

Notice: Sample material will be stored for 2 months after test report date. Please contact us if an extended storage time is required or if sample material needs to be returned. Sample material for emission tests cannot be retained for repeated tests, it will only be stored for identification and documentation purposes.

Methods:

Proceeding

The test was performed following DIN EN 16846 part 1: Photocatalysis - Measurement of efficiency of photocatalytic devices used for the elimination of VOC and odour in indoor air in active mode - Part 1: Batch mode test method in closed chamber; German version EN 16846-1:2017, chapter 7.6. For this purpose, the air cleaner was placed into a 4m³-emission test chamber according to DIN EN ISO 16000-9. The chamber was run over night at 23°C and 50% r.h. with an air exchange rate of 0.5/h for conditioning. Afterwards, the device and the air exchange were set off and the compounds acetaldehyde, acetone, heptane and toluene were injected as a liquid mixture. Additionally, formaldehyde was injected in gaseous state. The target

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concentration was 50 ppb. 15 min after the injection the air cleaner was turned on and the declination curves were monitored for app. 3h.

Results:

Ozone was not detected during the complete experiment with a determination limit of 1 µg/m³.

The investigations for emissions of volatile organic compounds when the system was running without dosing any compounds at an air exchange rate of 0.5/h, a temperature of 23°C and 50% r.h. showed some ethanol emissions with a concentration of 57 µg/m³ (30,1 ppb). The concentration decreased within 30 min after having started the test under the determination limit of 1 µg/m³. Obviously, ethanol was emitted from a component of the air cleaner and was not generated as a by-product from degradation of one of the doped compounds. For all other compounds except ethanol the concentration was below 5 µg/m³. As a result, the generation of by-products was not detected according to the definitions of the standard.

The results from the measurements are shown in **Tab. 1 und 2**.

Tab. 1: The clean air delivery rates CADR were measured following DIN EN 16846-1 Annex H.

Compound	Formaldehyde	n-Heptane
CADR (m ³ /h)	19,5	41,7

Tab. 2: The clean air delivery rates (CADR) were estimated following DIN EN 16846-1 Annex H by linear regression after logarithmic plot of the concentration vs. time.

Compound	Acetaldehyd	Aceton	Toluen
CADR (m ³ /h)	ca. 25*	ca. 25*	ca. 42*

*) r²<0,98

In another study performed by WKI, three other air cleaners which were not equipped with an active charcoal filter were tested with different test compounds¹. The doped concentrations were app. between 30 ppb und 900 ppb. The CADR (clean air delivery rates) in most cases were below 20 m³/h, in some cases even below 10 m³/h.

Costarramone et al.² also have tested air cleaners from the market. Here, besides others, toluene, acetone and n-heptane were used as test compounds. The concentration was app. 250 ppb. For devices running with UVA light the CADR were between 0,8 und 22 m³/h.

¹ Gunschera, J., D. Markewitz, B. Bansen, T. Salthammer and H. Ding (2016). "Portable photocatalytic air cleaners: efficiencies and by-product generation." Environmental Science and Pollution Research 23(8): 7482-7493.

² Costarramone, N., B. Kartheuser, C. Pecheyran, T. Pigot and S. Lacombe (2015). "Efficiency and harmfulness of air-purifying photocatalytic commercial devices: From standardized chamber tests to nanoparticles release." Catalysis Today 252: 35-40.

Chen et. al. have measured CADR of photocatalytical air cleaners under dynamic conditions over 12h³. For form- and acetaldehyde the results were far below 10 m³/h, for hexane up to 53 m³/h and for toluene up to values barely below 100 m³/h.

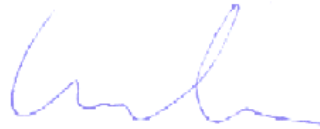
For all tested compounds the CADR of the device investigated in this study were at the top of such devices which are running without active charcoal filtering.

Officer in Charge



Dr. Jan Gunschera

For the department



Dr. Erik Uhde

³ Chen, W., J. Zhang and Z. Zhang (2005). "Performance of Air Cleaners for Removing Multiple Volatile Organic Compounds in Indoor Air." Ashrae Transactions **111**(1): 1101-1114.