



# No critical particle emissions from HP Jet Fusion 3D printers

## Device performance undergoes strict safety consideration



**Contact:**  
Sustainability and Compliance Center  
(SCC)

[sustainability@hp.com](mailto:sustainability@hp.com)

[hp.com](http://hp.com)

[hp.com/supplies](http://hp.com/supplies)

Customers expect safe particle release behaviour from operation and handling of their HP Multi Jet Fusion 3D printing solutions. Evaluation needs to include different particles types potentially emitted – in particular fine and ultrafine particles. Indicative testing demonstrates that HP devices provide a high level of safety.

### Fine dust emissions are negligible

Emissions from the operation of HP Multi Jet Fusion 3D printing solutions in the fine particles size range of 0.3 to 10.0 micrometres ( $\mu\text{m}$ ) are well below a variety of mandatory and voluntary environmental requirements, as indicative testing has shown.<sup>(1)</sup>

When compared against mandatory occupational limits and toxicologically based indoor air guide values, devices are far below relevant values. For example, the devices meet the fine particles criteria of the German AGW<sup>(2)</sup> and the U.S Permissible Exposure Limits (PELs)<sup>(3)</sup>. Accordingly, testing concluded that no health risks are expected when the devices are used and maintained as intended.

### Ultrafine particles release is very low

For the extremely small ultrafine particles (UFPs) with a diameter of below 0.1  $\mu\text{m}$ , concentrations resulting from the operation of HP Jet Fusion 3D printers are also quite low.<sup>(1)</sup> Particle numbers lie well below the precautionary guide value of the German Blue Angel<sup>(4)</sup>. And due to the UFPs' volatile nature, they do not hold the health hazardous potential associated with the solid consistency of particles in the ultrafine size range. Based on these observations, no health risks due to UFP release by HP Jet Fusion 3D printers have to be expected under reasonably foreseeable conditions of use as well.

### Larger particles do not present a concern as well

Particles with an average diameter of more than 10  $\mu\text{m}$  generally have a lower exposure potential due to the propensity of these particles dropping out of the air. And, if inhaled, particles of this size are deposited in the upper regions of the human respiratory tract where they are subject to efficient clearance mechanisms. In addition to these physical considerations, the inherent chemical properties of HP 3D materials do not indicate a health risk as they are not classified or labelled as hazardous according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)<sup>(5)</sup>, the assessment criteria for mixtures in the European Union<sup>(6)</sup>, and applicable requirements in the United States<sup>(7)</sup>.

And as material powders in fact consist of particles with an average diameter of approximately 60  $\mu\text{m}$ , their physical properties do not present the toxicological intensity typically seen with smaller solid particles. As an additional precaution, HP Jet Fusion 3D printers feature enclosed systems for powder management, which are designed in a way which reduces the likelihood of inadvertently coming into contact with printing material powder. Large models are equipped with a special installation for actively removing residual particles. Outside the machine, incidental levels of particles can simply be removed with a suitable vacuum cleaner<sup>(8)</sup> or wiped off e.g. the skin with cold water – as described in the respective safety data sheets and/or user guide.

Supporting references:

<sup>(1)</sup> HP commissioned indicative testing of HP Jet Fusion 3D 3200 and 4200 Printers operated with HP 3D PA12 material, carried out by the Fraunhofer Wilhelm-Klauditz-Institute (WKI), Braunschweig, Germany, 2016/2017. Indicative testing of devices of the HP Jet Fusion 300/500 (Color) series with HP 3D HR CB PA12 material was carried out by UL Environment Inc., Marietta (GA), USA, in 2018. <sup>(2)</sup> Workplace limits (AGW), TRGS 900, German Ordinance of Hazardous Substances (GefStoffV), German Committee on Hazardous Substances (AGS), 2006 (as amended). <sup>(3)</sup> PELs-TWA, 29 CFR 1910.1000 Z-1 and Z-2, OSHA, 2006. <sup>(4)</sup> Basic criteria for award of the German Blue Angel (BA) environmental label for Office Equipment with Printing Function, DE-UZ 205, RAL gGmbH. <sup>(5)</sup> GHS, ST/SG/AC.10/30/Rev. 5, United Nations, 2013. <sup>(6)</sup> REG. (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, European Parliament and Council, 2008 (as amended). <sup>(7)</sup> Occupational Safety and Health Standards, Toxic and Hazardous Substances, 1910.1200, OSHA, 2012 (as amended). <sup>(8)</sup> If a customer is cleaning a lot of powder, an explosion-proof vacuum needs to be used.

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