



# HP 3D Printing materials



Data courtesy of Vizua Heart of Bernard Werber  
and Invent Medical

# Breaking down barriers to 3D printing adoption through materials innovation

Leading the charge into a new era of digital manufacturing, HP 3D Printing solutions are providing new opportunities for businesses and industries. HP Multi Jet Fusion technology disrupts the status quo with a solution that can transform part properties voxel by voxel—enabling a future of limitless applications, materials, and colors. Imagine a future where we can produce “Smart Parts” with embedded electronics and integrated traceability and intelligence. Materials innovation is at the heart of making this vision a reality.

To help your business get ready for a future era of digital manufacturing, HP is working hard to enable new materials innovations that break down some of the traditional barriers to 3D printing adoption—cost, quality, performance, and diversity. HP is doing this through a growing portfolio of HP-branded powders and materials certified for HP Jet Fusion 3D Printing.



## HP 3D Printing materials for HP Jet Fusion 5200/4200 Series 3D Printing Solutions

In addition to our flagship material, HP 3D High Reusability PA 12, HP is growing its portfolio of thermoplastics. Powders such as HP 3D High Reusability PA 12 Glass Beads and HP 3D High Reusability PA 11, deliver optimal mechanical properties. Engineered for HP Multi Jet Fusion technology, these materials test the limits of functional part creation, optimizing cost and part quality, while also delivering high<sup>1</sup> and, in many cases, industry-leading reusability<sup>2</sup> at a low cost per part.<sup>3</sup>

### HP 3D High Reusability PA 11— ideal for producing ductile,<sup>4</sup> quality parts

#### Produce strong, ductile,<sup>4</sup> functional parts

- Thermoplastic material delivering optimal mechanical properties
- Provides excellent chemical resistance<sup>5</sup> and enhanced elongation-at-break<sup>4</sup>
- Impact resistance and ductility<sup>4</sup> for prostheses, insoles, sports goods, snap fits, living hinges, and more
- Biocompatibility certifications—meets USP Class I-VI and US FDA guidance for Intact Skin Surface Devices<sup>6</sup>

#### Minimize waste with a renewable raw material<sup>7</sup>

- Renewable raw material from vegetable castor oil (reduced environmental impact)<sup>7</sup>
- Minimize waste—reuse surplus powder batch after batch and get functional parts, no throwing away anymore<sup>2</sup>
- Get consistent performance while achieving up to 70% surplus powder reusability<sup>8</sup>
- Optimize cost and part quality—cost-efficient material with industry-leading surplus powder reusability<sup>2</sup>

#### Engineered for HP Multi Jet Fusion technology

- Designed for production of functional and final parts across a variety of industries
- Provides the best balance between performance and reusability<sup>9</sup>
- Easy-to-process material enables high productivity and less waste<sup>10</sup>
- Engineered to reliably produce final parts and functional prototypes with fine detail, dimensional accuracy



	Powder melting point (DSC)	Particle size	Bulk density of powder
Value	202° C/396° F	54 µm	0.48 g/cm <sup>3</sup> /0.017 lb/in <sup>3</sup>
Method	ASTM D3418	ASTM D3451	ASTM D1895

## HP 3D High Reusability PA 12— ideal for producing strong, quality parts at a low cost per part<sup>3</sup>

### Produce strong, functional, detailed complex parts

- Robust thermoplastic produces high-density parts with balanced property profiles and strong structures
- Provides excellent chemical resistance to oils, greases, aliphatic hydrocarbons, and alkalies<sup>5</sup>
- Ideal for complex assemblies, housings, enclosures, and watertight applications
- Biocompatibility certifications—meets USP Class I-VI and US FDA guidance for Intact Skin Surface Devices<sup>6</sup>

### Quality at a low cost per part<sup>3</sup>

- Achieve a low cost per part<sup>3</sup> and reduce your total cost of ownership<sup>11</sup>
- Minimize waste—reuse surplus powder batch after batch and get functional parts, no throwing away anymore<sup>2</sup>
- Get consistent performance while achieving up to 80% surplus powder reusability<sup>12</sup>
- Optimize cost and part quality—cost-efficient material with industry-leading surplus powder reusability<sup>2</sup>

### Engineered for HP Multi Jet Fusion technology

- Designed for production of functional parts across a variety of industries
- Provides the best balance between performance and reusability<sup>13</sup>
- Achieves watertight properties without any additional post-processing
- Engineered to produce final parts and functional prototypes with fine detail and dimensional accuracy



	Powder melting point (DSC)	Particle size	Bulk density of powder
Value	187° C/369° F	60 µm	0.425 g/cm³/0.015 lb/in³
Method	ASTM D3418	ASTM D3451	ASTM D1895

## HP 3D High Reusability PA 12 Glass Beads<sup>14</sup>— ideal for producing stiff, dimensionally stable, quality parts

### Produce stiff, functional parts

- 40% glass bead filled thermoplastic material with both optimal mechanical properties and high reusability<sup>1</sup>
- Provides dimensional stability along with repeatability<sup>15</sup>
- Ideal for applications requiring high stiffness like enclosures and housings, fixtures and tooling

### Quality and high reusability<sup>1</sup>

- Less waste—reuse surplus powder batch after batch and get functional parts, no throwing away anymore<sup>1</sup>
- Get consistent performance while achieving up to 70% surplus powder reusability<sup>16</sup>
- Optimize cost and part quality—cost-efficient material with high surplus powder reusability<sup>1</sup>

### Engineered for HP Multi Jet Fusion technology

- Designed for production of functional parts across a variety of industries
- Provides the best balance between performance and reusability<sup>17</sup>
- Engineered to produce common glass bead applications with detail and dimensional accuracy



	Powder melting point (DSC)	Particle size	Bulk density of powder
Value	186° C/367° F	58 µm	0.48 g/cm³/0.017 lb/in³
Method	ASTM D3418	ASTM D3451	ASTM D1895

## Recognized certifications provide reassurance

HP 3D Printing materials are compliant with a number of important certifications that help provide reassurance that parts produced with these thermoplastic materials adhere to health and safety related restrictions.

Certifications	HP 3D High Reusability PA 11	HP 3D High Reusability PA 12	HP 3D High Reusability PA 12 Glass Beads <sup>14</sup>
Biocompatibility <sup>6</sup>	✓	✓	n/a
REACH	✓	✓	✓
RoHS*	✓	✓	✓
PAHs	✓	✓	✓
Statement of Composition for Toy Applications	✓	✓	n/a
UL 94 and UL 746A Certification	n/a	✓	✓

\* RoHS certification for EU, Bosnia-Herzegovina, China, India, Japan, Jordan, Korea, Serbia, Singapore, Turkey, Ukraine, Vietnam.

# HP 3D Printing materials for HP Jet Fusion 500/300 Series 3D Printers



Data courtesy of Phoenix Children's Hospital; Heart of Jemma

## HP 3D High Reusability CB PA 12— engineering-grade full-color<sup>18</sup> and white parts

### Strong, functional complex parts

- Robust thermoplastic produces high-density parts with balanced property profiles and strong structures
- Provides excellent chemical resistance to oils, greases, aliphatic hydrocarbons, and alkalis<sup>5</sup>
- Ideal for color<sup>18</sup> and white parts like jigs, fixtures, labeling, presentation models, functional prototypes

### Full-color<sup>18</sup> and white quality parts

- Produce functional parts in full-color<sup>18</sup> and white with optimal mechanical properties
- Get consistent performance while achieving up to 80% surplus powder reusability<sup>12</sup>
- Optimize cost and quality—full-color<sup>18</sup> and white functional parts and industry-leading reusability<sup>2</sup>

### Engineered for HP Multi Jet Fusion technology

- Designed for production of full-color<sup>18</sup> and white functional parts across a variety of industries
- Provides the best balance between color<sup>18</sup> and white performance, and reusability<sup>13</sup>
- Engineered to produce functional prototypes with fine detail and dimensional accuracy

	Powder melting point (DSC)	Particle size	Bulk density of powder
Value	189° C/372.2° F	58 µm	0.442 g/cm <sup>3</sup> /0.016 lb/in <sup>3</sup>
Method	DIN EN ISO 11357	ISO 8130/13	ISO 60

## HP 3D Printing materials portfolio selection guide

	HP 3D Printing Materials for HP Jet Fusion 5200 Series 3D Printing Solutions				HP 3D Printing Materials for the HP Jet Fusion 4200 3D Printing Solution					HP 3D Printing Materials for HP Jet Fusion 500/300 Series 3D Printers
Usage and properties	HP 3D HR PA 11	HP 3D HR PA 12	HP 3D HR PA 12 GB <sup>14</sup>	BASF Ultrasint™ TPU01 <sup>15</sup>	HP 3D HR PA 11	HP 3D HR PA 12	HP 3D HR PA 12 GB <sup>14</sup>	VESTOSINT® 3D Z2773 PA 12 <sup>20</sup>	ESTANE® 3D TPU M95A <sup>21</sup>	HP 3D HR CB PA 12
Visual aids & presentation models	●	●	●	●	●	●	●	●	●	●
Functional prototyping	●	●	●	●	●	●	●	●	●	●
End-use parts	●	●	●	●	●	●	●	●	●	●
Dimensional stability	●	●	●	●	●	●	●	●	●	●
Functional rigid part (higher stiffness)	●	●	●	●	●	●	●	●	●	●
Ductile part (higher elongation at break)	●	●	●	●	●	●	●	●	●	●
Impact	●	●	●	●	●	●	●	●	●	●
HDT (heat deflection temperature)	●	●	●	●	●	●	●	●	●	●
Medical biocompatibility <sup>6</sup> (USP Class I-VI and US FDA guidance for Intact Skin Surface Devices)	●	●	●	●	●	●	●	●	●	●
Look and feel	●	●	●	●	●	●	●	●	●	●

● Excellent
 ● Good
 ● Fair
 ● Not recommended
 ● In testing



# HP 3D materials certification program

The certification program provides an opportunity and pathway for third-party vendors to develop materials compatible with HP Jet Fusion 3D Printing Solutions.

**Joining the HP 3D Materials Certification Program** enables material innovation partners to help expand 3D printing materials to address a broader set of applications—driving performance improvements and new possibilities for part properties that address specific industry needs—and making new applications possible.

Materials partners interested in engaging with HP are invited to complete the “Connect with us” form here: [hp.com/go/3Dcontactus](https://hp.com/go/3Dcontactus).

## Materials Certified for HP Jet Fusion 3D Printing



HP is committed to expanding our portfolio of materials certified for HP Jet Fusion 3D Printing Solutions. We're working with a variety of other third-party vendors to increase the materials and application options available.

### VESTOSINT® 3D Z2773 PA 12— strong, lightweight parts

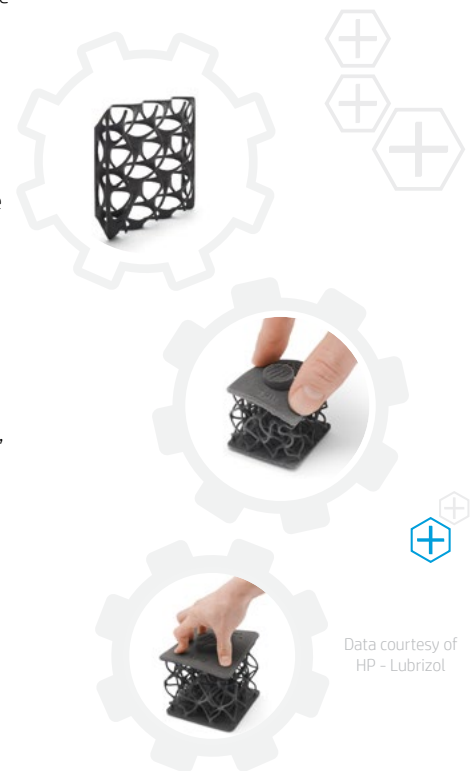
The first certified material for HP Jet Fusion 3D printers. This multi-purpose, affordable thermoplastic material is ideal for the production of strong parts, enabling design of lightweight structures with great color uniformity.<sup>20</sup>

### BASF Ultrasint™ TPU01<sup>19</sup>— flexible, functional parts

Produce flexible TPU parts, with a high throughput, excellent quality and level of detail, and suitable for a wide range of applications.

### ESTANE® 3D TPU M95A<sup>21</sup>— high rebound and low abrasion resistance

An ideal fit for both prototyping and manufacturing scale-up applications, delivering high energy rebound, high-impact absorption, a low abrasion rate and high elasticity, combined with excellent unpacking/de-powdering properties.



## Active partnerships

We're working with the following industry-leading materials companies to better address 3D printing needs across industries. Together with our growing network of materials innovation partners, we're enabling performance improvements and new possibilities for part properties.



## Hands-on materials advancement

HP offers tools and resources that encourage and support third-party materials innovation and development.

**Jumpstart the development process with the Material Development Kit (MDK)**—Developed by HP and SIGMADESIGN, the industry's first MDK helps materials suppliers more effectively—and successfully—develop their first powder materials for the HP Multi Jet Fusion platform. The MDK enables companies interested in certifying their materials to quickly test 3D powder spreadability and compatibility with HP Jet Fusion 3D printers prior to submitting the materials to HP for testing.



**HP 3D Open Platform Materials and Applications Lab**—As part of our commitment to the evolution and widespread adoption of 3D printing, we're inviting materials companies to work in a collaborative lab environment. Located in Corvallis, Oregon, the new HP 3D Open Platform Materials and Applications Lab is the world's first state-of-the-art lab helping companies develop, test, certify, and deliver the next generation of materials and applications for HP 3D Printing.

This 3,500 square-foot facility offers 3D partners a range of equipment and in-house expertise to jumpstart and accelerate materials innovation and the development of new applications. This is critical to quickening the evolution and adoption of 3D printing technologies.



**Technical Guideline for Material Development with HP 3D Open Materials Platform**—Access to comprehensive technical guidelines for suppliers who are interested in developing suitable materials for HP Multi Jet Fusion technology through the HP Open Materials Platform. For more information, please visit [hp.com/go/guidelinematerialdevelopment](https://hp.com/go/guidelinematerialdevelopment).

## Designed for more sustainable 3D printing

HP Multi Jet Fusion technology and HP 3D Printing materials and agents are designed to help drive a more sustainable digital transformation.

### Safety first

- ✓ HP 3D powders and agents are not classified as health hazards;<sup>23</sup> for agents:
  - no Hazardous Air Pollutants (HAPs)<sup>24</sup>
  - non-flammable and non-combustible<sup>25</sup>
- ✓ Biocompatibility certification for medical devices<sup>6</sup>
- ✓ Agents and materials can be used for toys<sup>26</sup>

### Reduced environmental impact always

- ✓ Industry-leading surplus powder reusability<sup>2</sup>
- ✓ Free printhead recycling<sup>27</sup>
- ✓ Up to 80% of the weight of used agent/powder container is locally recyclable cardboard<sup>28</sup>
- ✓ Renewable raw material: HP 3D High Reusability PA 11<sup>7</sup>

# Ordering information



Material		HP Jet Fusion 5200 Series 3D Printing Solutions	HP Jet Fusion 4200 Series 3D Printing Solutions	HP Jet Fusion 500/300 Series 3D Printers
V1R12A	HP 3D High Reusability PA 11 30L (14 kg)	Yes	Yes	n/a
V1R18A	HP 3D High Reusability PA 11 300L (140 kg)	Yes	Yes	n/a
V1R36A	HP 3D High Reusability PA 11 Production Material 300L (140 kg) <sup>29</sup>	Yes	Yes	n/a
V1R24A	HP 3D High Reusability PA 11 1700L (750 kg) <sup>30,31,32,33</sup>	Yes	Yes	n/a
V1R10A	HP 3D High Reusability PA 12 30L (13 kg)	Yes	Yes	n/a
V1R16A	HP 3D High Reusability PA 12 300L (130 kg)	Yes	Yes	n/a
V1R34A	HP 3D High Reusability PA 12 Production Material 300L (130 kg) <sup>29</sup>	Yes	Yes	n/a
V1R20A	HP 3D High Reusability PA 12 1400L (600 kg) <sup>30,31,32</sup>	Yes	Yes	n/a
V1R11A	HP 3D High Reusability PA 12 Glass Beads 30L (15 kg)	Yes <sup>14</sup>	Yes	n/a
V1R22A	HP 3D High Reusability PA 12 Glass Beads 300L (150 kg)	Yes <sup>14</sup>	Yes	n/a
V1R35A	HP 3D High Reusability PA 12 Glass Beads Production Material 300L (150 kg) <sup>29</sup>	Yes <sup>14</sup>	Yes	n/a
V1R23A	HP 3D High Reusability PA 12 Glass Beads 1400L (700 kg) <sup>30,31,32</sup>	Yes <sup>14</sup>	Yes	n/a
V1R30A	HP 3D High Reusability CB PA 12 10L (4 kg)	n/a	n/a	Yes
EVNV1R14A	VESTOSINT® 3D Z2773 PA 12 30L (14 kg)	n/a	Yes	n/a
EVNV1R17A	VESTOSINT® 3D Z2773 PA 12 300L (140 kg)	n/a	Yes	n/a
n/a	BASF Ultrasint™ TPU01	Yes	n/a	n/a
3DTW0030	ESTANE® 3D TPU M95A 30L (16 kg) <sup>21</sup>	n/a	Yes	n/a
3DTW0300	ESTANE® 3D TPU M95A 300L (160 kg) <sup>21</sup>	n/a	Yes	n/a

Note: Liters refers to the materials container size and not the actual materials volume. Materials are measured in kilograms.

## Eco Highlights



- HP 3D powders and agents are not classified as health hazards<sup>23</sup>
- Cleaner, more comfortable experience—enclosed printing system, and automatic powder management<sup>34</sup>
- Minimizes waste due to industry-leading reusability of powder<sup>2</sup>
- Take-back program for agent cartridges<sup>27</sup>

Find out more about HP sustainable solutions at [hp.com/go/ecosolutions](https://hp.com/go/ecosolutions)

Dynamic security enabled printer. Only intended to be used with cartridges using an HP original chip. Cartridges using a non-HP chip may not work, and those that work today may not work in the future.  
More at: [hp.com/go/learnaboutesupplies](https://hp.com/go/learnaboutesupplies)

For more information, please visit  
[hp.com/go/3DMaterials](https://hp.com/go/3DMaterials)



Data courtesy of Invent Medical

1. Based on using recommended packing densities, offers high reusability of surplus powder. Liters refers to the materials container size and not the actual materials volume. Materials are measured in kilograms.
2. Based on using recommended packing densities and compared to selective laser sintering (SLS) technology, offers excellent reusability without sacrificing mechanical performance. Tested according to ASTM D638, ASTM D256, ASTM D790, and ASTM D648 and using a 3D scanner. Testing monitored using statistical process controls.
3. Based on internal testing and public data for solutions on market as of April, 2016. Cost analysis based on: standard solution configuration price, supplies price, and maintenance costs recommended by manufacturer. Cost criteria: printing 1.4 full build chambers of parts per day/5 days per week over 1 year of 30 cm<sup>3</sup> parts at 10% packing density on Fast print mode using HP 3D High Reusability PA 12 material, and the powder reusability ratio recommended by manufacturer, and printing under certain build conditions and part geometries.
4. Testing according to ASTM D638, ASTM D256, and ASTM D648 using HDT at different loads with a 3D scanner for dimensional accuracy. Testing monitored using statistical process controls.
5. Tested with diluted alkalies, concentrated alkalies, chlorine salts, alcohol, ester, ethers, ketones, aliphatic hydrocarbons, unleaded petrol, motor oil, aromatic hydrocarbons, toluene, and DOT 3 brake fluid.
6. Based on HP internal testing, June 2017, HP 3D600/3D700/3D710 Fusing and Detailing Agents, HP 3D High Reusability PA 11 powder, and HP 3D High Reusability PA 12 powder meet USP Class I-VI and US FDA's guidance for Intact Skin Surface Devices. Tested according to USP Class I-VI including irritation, acute systemic toxicity, and implantation; cytotoxicity per ISO 10993-5; Biological evaluation of medical devices—part 5: Tests for in vitro cytotoxicity; and sensitization per ISO 10993-10; Biological evaluation of medical devices—Part 10: Tests for irritation and skin sensitization. It is the responsibility of the customer to determine that its use of the fusing and detailing agents and powder is safe and technically suitable to the intended applications and consistent with the relevant regulatory requirements (including FDA requirements) applicable to the customer's final product. For more information, see [hp.com/go/biocompatibilitycertificate/PA11](http://hp.com/go/biocompatibilitycertificate/PA11) and [hp.com/go/biocompatibilitycertificate/PA12](http://hp.com/go/biocompatibilitycertificate/PA12).
7. HP 3D High Reusability PA 11 powder is made with 100% renewable carbon content derived from castor plants grown without GMOs in arid areas that do not compete with food crops. HP 3D High Reusability PA 11 is made using renewable sources, and may be made together with certain non-renewable sources. A renewable resource is a natural organic resource that can be renewed at the same speed in which it is consumed. Renewable stands for the number of carbon atoms in the chain coming from renewable sources (in this case, castor seeds) according to ASTM D6866.
8. HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PA 11 provide up to 70% powder reusability ratio, producing functional parts batch after batch. For testing, material is aged in real printing conditions and powder is tracked by generations (worst case for reusability). Parts are then made from each generation and tested for mechanical properties and accuracy.
9. Compared to selective laser sintering (SLS) technology. Providing an elongation at break XY of 50% with up to 70% powder reusability ratio according to the ASTM D638 test method. For testing, material is aged in real printing conditions and powder is tracked by generations (worst case for reusability). Parts are then made from each generation and tested for mechanical properties and accuracy.
10. Easier to process than standard HP 3D High Reusability PA 12, providing proper fusing along with good spreadability and compatibility due to its small particle size.
11. Compared to selective laser sintering (SLS) and fused deposition modeling (FDM) technologies, HP Multi Jet Fusion technology can reduce the overall energy requirements needed to attain full fusing and reduce the system requirements for large, vacuum-sealed ovens. In addition, HP Multi Jet Fusion technology uses less heating power than SLS systems for better material properties and material reuse rates, minimizing waste.
12. HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PA 12 and HP 3D High Reusability CB PA 12 provide up to 80% powder reusability ratio, producing functional parts batch after batch. For testing, material is aged in real printing conditions and powder is tracked by generations (worst case for reusability). Parts are then made from each generation and tested for mechanical properties and accuracy.
13. Compared to selective laser sintering (SLS) technology. Tested according to ASTM D638, ASTM D256, ASTM D790, and ASTM D648.
14. Available for the HP Jet Fusion 4200 3D Printing Solution. Expected general availability beginning 2020 for HP Jet Fusion 5200 Series 3D Printing Solutions.
15. Testing according to ASTM D638, ASTM D256, and ASTM D648 with a 3D scanner for dimensional stability. Testing monitored using statistical process controls.
16. HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PA 12 Glass Beads provide up to 70% powder reusability ratio, producing functional parts batch after batch. For testing, material is aged in real printing conditions and powder is tracked by generations (worst case for reusability). Parts are then made from each generation and tested for mechanical properties and accuracy.
17. Compared to selective laser sintering (SLS) technology. Based on running a scan on the 3D printing part to measure and compare with the original STL file (using GOM software). For testing, material is aged in real printing conditions and powder is tracked by generations (worst case for reusability). Parts are then made from each generation and tested for mechanical properties and accuracy.
18. Full color parts applicable only with the HP Jet Fusion 580/380 Color 3D Printers.
19. Available for the HP Jet Fusion 5200 Series 3D Printing Solution.
20. The only terms and conditions governing the sale of HP 3D printer solutions are those set forth in a written sales agreement. The only warranties for HP products and services are set forth in the express warranty statements for such products and services. Nothing herein should be construed as constituting an additional warranty or additional binding terms and conditions. HP shall not be liable for technical or editorial errors or omissions contained herein and the information herein is subject to change without notice. The Materials Certified for HP Jet Fusion 3D Printing have not been designed, manufactured, or tested by HP for compliance with legal requirements and recipients are responsible for making their own determination as to the suitability of VESTOSINT® 3D Z2773 for their purposes, including but not limited as regards direct or indirect food contact applications.
21. Expected general availability beginning 2020 for the HP Jet Fusion 4200 3D Printing Solution.
22. Nothing herein should be construed as constituting an additional HP warranty. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services and/or in a written agreement between you and HP for such HP products and services. HP believes that the information herein is correct based on the current state of scientific knowledge and as the date of its publication, however, to the maximum extent permitted by law HP EXPRESSLY DISCLAIMS ANY REPRESENTATIONS AND WARRANTIES OF ANY KIND, WHETHER EXPRESS OR IMPLIED, AS TO THE ACCURACY, COMPLETENESS, NON-INFRINGEMENT, MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE (EVEN IF HP IS AWARE OF SUCH PURPOSE) WITH RESPECT TO ANY INFORMATION PROVIDED. Except to the extent that exclusion is prevented by law, HP shall not be liable for technical or editorial errors or omissions contained herein and the information herein is subject to change without notice. HP shall not be liable for damages or losses of any kind or nature that result from the use of or reliance upon this information. The HP Jet Fusion 3D Materials have not been designed, manufactured or tested by HP for compliance with legal requirements for 3D printed parts and their uses and recipients are responsible for making their own determination as to the suitability of HP Jet Fusion 3D Materials for their purposes and uses, ensure compliance with applicable laws and regulations, and be aware that other safety or performance considerations may arise when using, handling or storing the product.
23. The HP powder and agents do not meet the criteria for classification as hazardous according to GHS and Regulation (EC) 1272/2008 as amended.
24. HP 3D agents were tested for Hazardous Air Pollutants, as defined in the Clean Air Act, per U.S. Environmental Protection Agency Method 311 (testing conducted in 2016) and none were detected.
25. HP 3D agents are not classified as flammable or combustible liquids under the USDOT or international transportation regulations. Testing per the Pensky-Martins Closed Cup method demonstrated flash point greater than 110°C.
26. Parts made with HP 3D600 Fusing and Detailing Agents and HP 3D High Reusability PA 12 have undergone the following tests: 1) Heavy Metal: No metals were detected in the study with a limit of detection of 2.5 ppm. The submitted samples comply with the soluble heavy metals requirements according to section 4.3.5.2 2(b) of ASTM F963-11. 2) Phthalates: No phthalates were detected down to 0.005% in the study. The submitted sample passed the applicable requirements for phthalates as recommended by the Consumer Product Safety Improvement Act of 2008, Section 108. 3) Bisphenol A (BPA): No Bisphenol A was detected in the sample down to 0.1 ppm. 4) Migration study: The migration study with synthetic saliva and gastric fluid revealed no verifiable components leaching from the investigated material under room temperature conditions.
27. Printing supplies eligible for recycling vary by printer. Visit [hp.com/recycle](http://hp.com/recycle) to see how to participate and for HP Planet Partners program availability; program may not be available in your area. Where this program is not available, and for other consumables not included in the program, consult your local waste authorities on appropriate disposal.
28. HP 3D agents and powders for the HP Jet Fusion 4200 3D Printing Solution are supplied in containers of which approximately 70% (agents) and 80% (powder) of the weight of the used container is a locally recyclable cardboard. Visit [hp.com/recycle](http://hp.com/recycle) to see how to disassemble and recycle the powder container.
29. Only compatible with the HP Jet Fusion 5210 Pro/5210/4210/4210B 3D Printing Solutions.
30. Additional material management equipment is required.
31. Only compatible with the HP Jet Fusion 5210 Pro/4210B 3D Printing Solutions.
32. This product number is sold directly by HP.
33. Expected general availability first half of 2020.
34. Compared to manual print retrieval process used by other powder-based technologies. The term "cleaner" does not refer to any indoor air quality requirements and/or consider related air quality regulations or testing that may be applicable.

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