

# HP 3D High Reusability PA 12

**Strong, lowest cost,<sup>1</sup> quality parts**



## **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>2</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>3</sup>

## **Quality at the lowest cost per part<sup>1</sup>**

- Achieve the lowest cost per part<sup>1</sup> and reduce your total cost of ownership.<sup>4</sup>
- Minimize waste—reuse surplus powder batch after batch and get functional parts, no throwing away anymore.<sup>5</sup>
- Get consistent performance while achieving up to 80% surplus powder reusability.<sup>6</sup>
- Optimize cost and part quality—cost-efficient material with industry-leading surplus powder reusability.<sup>5</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>7</sup>
- Achieves watertight properties without any additional post-processing.
- Engineered to produce final parts and functional prototypes with fine detail and dimensional accuracy.



Picture taken after graphite post-processing

# Technical specifications<sup>8</sup>

| Category                             | Measurement                                                                                                                                                        | Value                                             | Method                  |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------|
| General properties                   | Powder melting point (DSC)                                                                                                                                         | 187° C/369° F                                     | ASTM D3418              |
|                                      | Particle size                                                                                                                                                      | 60 µm                                             | ASTM D3451              |
|                                      | Bulk density of powder                                                                                                                                             | 0.425 g/cm <sup>3</sup> /0.015 lb/in <sup>3</sup> | ASTM D1895              |
|                                      | Density of parts                                                                                                                                                   | 1.01 g/cm <sup>3</sup> /0.036 lb/in <sup>3</sup>  | ASTM D792               |
| Mechanical properties                | Tensile strength, max load, <sup>9</sup> XY, XZ, YX, YZ                                                                                                            | 48 MPa/6960 psi                                   | ASTM D638               |
|                                      | Tensile strength, max load, <sup>9</sup> ZX, ZY                                                                                                                    | 48 MPa/6960 psi                                   | ASTM D638               |
|                                      | Tensile modulus, <sup>9</sup> XY, XZ, YX, YZ                                                                                                                       | 1800 MPa/261 ksi                                  | ASTM D638               |
|                                      | Tensile modulus, <sup>9</sup> ZX, ZY                                                                                                                               | 1800 MPa/261 ksi                                  | ASTM D638               |
|                                      | Elongation at break, <sup>9</sup> XY, XZ, YX, YZ                                                                                                                   | 20%                                               | ASTM D638               |
|                                      | Elongation at break, <sup>9</sup> ZX, ZY                                                                                                                           | 15%                                               | ASTM D638               |
|                                      | Flexural strength (@ 5%), <sup>10</sup> XY, XZ, YX, YZ                                                                                                             | 70 MPa/10150 psi                                  | ASTM D790               |
|                                      | Flexural strength (@ 5%), <sup>10</sup> ZX, ZY                                                                                                                     | 70 MPa/10150 psi                                  | ASTM D790               |
|                                      | Flexural modulus, <sup>10</sup> XY, XZ, YX, YZ                                                                                                                     | 1800 MPa/261 ksi                                  | ASTM D790               |
|                                      | Flexural modulus, <sup>10</sup> ZX, ZY                                                                                                                             | 1800 MPa/261 ksi                                  | ASTM D790               |
|                                      | Izod impact notched (@ 3.2 mm, 23° C), XY, XZ, YX, YZ                                                                                                              | 3.6 kJ/m <sup>2</sup>                             | ASTM D256 Test Method A |
|                                      | Izod impact notched (@ 3.2 mm, 23° C), ZX, ZY                                                                                                                      | 3.5 kJ/m <sup>2</sup>                             | ASTM D256 Test Method A |
|                                      | Shore Hardness D, XY, XZ, YX, YZ, ZX, ZY                                                                                                                           | 80                                                | ASTM D2240              |
|                                      | Heat deflection temperature (@ 0.45 MPa, 66 psi), XY, XZ, YX, YZ                                                                                                   | 175° C/347° F                                     | ASTM D648 Test Method A |
| Thermal properties                   | Heat deflection temperature (@ 0.45 MPa, 66 psi), ZX, ZY                                                                                                           | 175° C/347° F                                     | ASTM D648 Test Method A |
|                                      | Heat deflection temperature (@ 1.82 MPa, 264 psi), XY, XZ, YX, YZ                                                                                                  | 95° C/203° F                                      | ASTM D648 Test Method A |
|                                      | Heat deflection temperature (@ 1.82 MPa, 264 psi), ZX, ZY                                                                                                          | 95° C/203° F                                      | ASTM D648 Test Method A |
|                                      |                                                                                                                                                                    |                                                   |                         |
| Reusability                          | Minimum refresh ratio for stable performance                                                                                                                       | 20%                                               |                         |
| Recommended environmental conditions | Recommended relative humidity                                                                                                                                      | 50-70% RH                                         |                         |
| Certifications                       | USP Class I-VI and US FDA guidance for Intact Skin Surface Devices, RoHS, <sup>11</sup> REACH, PAHs, UL 94, UL 746A, Statement of Composition for Toy Applications |                                                   |                         |

## Ordering information

|                            | HP 3D High Reusability PA 12                  | HP 3D High Reusability PA 12                   | HP 3D High Reusability PA 12 Production Material | HP 3D High Reusability PA 12 <sup>12, 13, 14</sup> |
|----------------------------|-----------------------------------------------|------------------------------------------------|--------------------------------------------------|----------------------------------------------------|
| Product number             | V1R10A                                        | V1R16A                                         | V1R34A                                           | V1R20A                                             |
| Weight                     | 13 kg/28.7 lb                                 | 130 kg/286.7 lb                                | 130 kg/286.7 lb                                  | 600 kg/1322.8 lb                                   |
| Capacity                   | 30L <sup>15</sup>                             | 300L <sup>15</sup>                             | 300L <sup>15</sup>                               | 1400L <sup>15</sup>                                |
| Dimensions (xyz)           | 600 x 333 x 302 mm<br>(23.6 x 13.1 x 11.9 in) | 800 x 600 x 1205 mm<br>(31.5 x 23.6 x 47.4 in) | 800 x 600 x 1205 mm<br>(31.5 x 23.6 x 47.4 in)   | 1143 x 1143 x 1500 mm<br>(45 x 45 x 59 in)         |
| Printer compatibility      | HP Jet Fusion 3D 4210/4200 Printing Solutions | HP Jet Fusion 3D 4210/4200 Printing Solutions  | HP Jet Fusion 3D 4210 Printing Solution          | HP Jet Fusion 3D 4210 Printing Solution            |
| Fast cooling compatibility | Compatible                                    | Compatible                                     | Compatible                                       | Compatible                                         |

### Eco Highlights

- Powders and agents are not classified as hazardous<sup>16</sup>
- Cleaner, more comfortable workplace—enclosed printing system, and automatic powder management<sup>17</sup>
- Minimizes waste due to industry-leading reusability of powder<sup>18</sup>

- 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. Common cost criteria: 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. HP Jet Fusion 3D 4200 Printing Solution average printing cost per part is half the average cost of comparable fused deposition modeling (FDM) and selective laser sintering (SLS) printer solutions from \$100,000 to \$300,000 USD. Cost criteria: printing 1 build chamber per day/5 days per week over 1 year of 30 cm<sup>3</sup> parts at 10% packing density. HP Jet Fusion 3D 4210 Printing Solution average printing cost per part is 65% lower versus the average cost of comparable FDM and SLS printer solutions from \$100,000 to \$300,000 USD and is 50% lower versus the average cost of comparable SLS printer solutions from \$300,000 to \$450,000 USD. 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.
- Tested with diluted alkalis, concentrated alkalis, chlorine salts, alcohol, ester, ethers, ketones, aliphatic hydrocarbons, unleaded petrol, motor oil, aromatic hydrocarbons, toluene, and DOT 3 brake fluid.
- Based on HP internal testing, June 2017, HP 3D600/3D700/3D710 Fusing and Detailing Agents 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 [www.hp.com/go/biocompatibilitycertificate/PA12](http://www.hp.com/go/biocompatibilitycertificate/PA12).
- 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.
- 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 for dimensional accuracy. Testing monitored using statistical process controls.
- HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PA 12 provide up to 80% post-production surplus powder reusability, 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.
- Compared to selective laser sintering (SLS) technology. Tested according to ASTM D638, ASTM D256, ASTM D790, and ASTM D648.
- The following technical information should be considered representative of averages or typical values and should not be used for specification purposes. These values are with FW TATDAG\_15\_18\_11.69 and have been obtained from a sample of specimens printed in plots with 6% packing density and 20% fresh powder. Separation between specimens in the plot was 10 mm. Modulus has been calculated using the slope of the regression line between 0.05% and 0.25% strain measured with an automatic extensometer during the entire test. Cross-section dimension measures using a micrometer with round ends. Conditioning according to ASTM D618 Procedure A. Testing conducted 48 hours after printing and unpacking of the parts at 23° C/73° F and 50% RH. Orientations defined according to ASTM F2971.
- Test results realized under the ASTM D638 with a test rate of 10 mm/min, specimens type V.
- Test results realized under ASTM D790 Procedure B at a test rate of 13.55 mm/min.
- RoHS certification for EU, Bosnia-Herzegovina, China, India, Japan, Jordan, Korea, Serbia, Singapore, Turkey, Ukraine, Vietnam.
- Additional material management equipment is required.
- This SKU is only available for the HP Jet Fusion 3D 4210B Printing Solution.
- This product number is sold directly by HP.
- Liters refers to the materials container size and not the actual materials volume. Materials are measured in kilograms.
- The HP powder and agents do not meet the criteria for classification as hazardous according to Regulation (EC) 1272/2008 as amended.
- 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.
- Compared to PA 12 materials available as of June, 2017. HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PA 12 provide up to 80% post-production surplus powder reusability, producing functional parts batch after batch.

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