



CIB#: CIB00222

Date: April 2021

Status: Non-confidential

Subject: Tips and info for building with DuraForm® PP White Engineered Thermoplastic on sPro 60® HD-HS SLS® systems

DuraForm PP White is an engineered production plastic for use in 3D Systems' sPro 60 HD-HS systems. DuraForm PP White offers chemical and automotive fluid resistance, good surface finish for organic and flat parts and up to 100% powder recyclability.

DuraForm PP White is available in Standard Production (SP) Mode. The material configuration file for SP mode is offered by 3D Systems. The process settings in the SP configuration files have been optimized to provide a good starting point to operate while using the recommended blend ratio with recycled powder (20% fresh-40% overflow-40% part cake). **There is a significant difference between the temperature settings for running 100% fresh powder compared to the recommended blend ratio (up to 8°C lower for fresh powder compared to SP Mode default). Please see section 5 on print modes and section 12 on *Blending Fresh and Used Powder* of this CIB and the DuraForm PP White Material Guide for more information on printing 100% fresh powder.** SP Mode is the default configuration and the recommended mode by 3D Systems while running the recommended powder blend.

The material process parameter set points may vary slightly from machine to machine due to differences in the machines installed location, environmental conditions and thermal sensors. As a result, the process parameters, more specifically the temperature set points and scale & offset values, may need slight adjustments from the defaults for optimal results.

Selected below is the most important information in order to build successfully with DuraForm PP White on a sPro60 HD-HS SLS system. For more details about this material, please refer to the DuraForm PP White Material Guide and for more details about the sPro60 HD-HS SLS system, please refer to the sPro 60 User Guide available on infocenter.3dsystems.com.

1. **Hardware Requirements:** Customers who desire to print DuraForm PP White Plastic material will require upgrading the roller to achieve the acceptable powder laying and compaction needed for good parts. We recommend using a sPro60 HD-HS printer for DuraForm PP White material which has piston feeding and enables ease of powder delivery and even layer distribution.

Counter Rotating Roller: An upgrade to the Counter-Rotating Roller is critical to successfully print with DuraForm PP White. Please contact your 3D Systems field service representative to verify whether you require this upgrade.

- **9204-20201**, Sinterstation Textured Roller Assembly

2. **Software Requirement:** DuraForm PP White configuration files are supported with Sinter V5.2 or higher.
3. **Build Preparation Software:** SLS Build Packet Files are created in the build preparation software. A Build Packet File (BPF) contains special instructions that are system and material specific. The initial default parameter values, provided in the DuraForm PP White material configuration files, are optimized for the

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recommended powder blend of 20% fresh, 40% part cake, and 40% overflow and will need adjustment for 100% fresh powder. Modification to parameter values may be recommended based on application or system condition. Please ensure you are using 3D Sprint version 3.1 or higher or Build Setup version 5.2 or higher. See section 4 for details.

- 4. **Material Configuration Files:** DuraForm PP White material configuration files require Sinter version 5.2 and are offered and compatible with the following build preparation software: 3D Sprint version 3.1 (support sPro60 Virtual Printer) or higher or with Build Setup version 5.2 or higher. For 3D Sprint, this material is available only on sPro60 virtual printer. You need to import 3D Sprint generated BPZ in Build Setup to print. For Build Setup, the DuraForm PP White configuration files can be downloaded from <http://infocenter.3dsystems.com/product-library/sls/...> and added to the "C: > dtm > config > material" folder located on the hard drive of the printer.

NOTE: The following are the material configuration files offered for DuraForm PP White: SP Mode.

SP mode contains the default values for general-purpose part building. The material configuration file offers the recommended parameters. The values in the material configuration files will be a good starting point for initial builds; however, some customers running DuraForm PP White may need to optimize certain parameters for their systems.

- 5. **SP mode:** SP mode controls the limits of the ProX SLS system to ensure customer gets the performance expected by default and removes variability that could occur during the print process.

The following table highlights the default process parameter values for the recommended blend ratio of 20%fresh-40%overflow-40%part cake:

Parameter	DuraForm PP White Recommended Blend Ratio
Part Bed Heater Set Point	131 °C
Powder Layer Thickness	0.1 mm
Fill Laser Power	21 W
Outline Laser Power	8 W
Scan Spacing	0.20 mm
Layer Thickness	0.1 mm
Fill Scan Count	2
Outline Scan Count	1
SinterScan™	1



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NOTE: These parameters are also suitable for blend ratios that use a ratio of reused powder (a combination of part cake and overflow); however, for builds with 100% fresh a lower default part bed temperature is recommended to avoid part bed cracking, powder sticking and part shifting during the build as seen in the table below (all other parameters are kept the same unless printability issues are seen. Please refer to the [“Solving Problems”](#) section in the DuraForm PP White Material Guide for more information about troubleshooting):

Parameter	DuraForm PP White 100% Fresh Powder
Part Bed Heater Set Point	125°C
Powder Layer Thickness	0.1 mm
Fill Laser Power	21 W
Outline Laser Power	8 W
Scan Spacing	0.20 mm
Layer Thickness	0.1 mm
Fill Scan Count	2
Outline Scan Count	1
SinterScan™	1

6. **Shrink and Beam offsets:** Note that shrinkage may vary slightly based on part geometry. The following table offers the starting values to use for scale and beam offsets for 20% fresh-40% overflow and 40% part cake powder blend and default parameters mentioned in section 5. These parameters are also a good starting point for 100% fresh powder and 50% overflow – 50% part cake blend ratios.

Parameter	DuraForm PP White
X scale	1.03667
Y scale	1.03344
Z scale	1.0180 -1.181E-5z
X Fill offset	0.144mm
Y Fill offset	0.152mm
X outline offset	0.118mm
Y outline offset	0.126mm

7. **Part Placement and Orientation in the SLS build volume:**

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- Large “blocky” cross-sections or structures are susceptible to distortion (post-build curl). Rotating the .stl file about X and/or Y can help to mitigate this distortion when used to minimize cross-sections on a per layer basis. Use the *View* application, and Clipping function in the Z Axis to identify large cross-sections. Please refer to sections “[Setting Up a Print](#)” and “[Part Placement and Orientation Guidelines](#)” in the DuraForm PP Material Guide for more details.
- Start these demanding parts later in the build (at greater Z) after other parts have been built.
- Parts with large flat cross-sections on the bottom are recommended to be oriented by 10 degree angle in X and Y to eliminate distortion (i.e. bowing) at the bottom when possible.
- Use the *Estimate* application to identify regions with high layer times and make adjustments in part placement and orientation to minimize layer times. Please read the section “[Cross-sections](#)” in the material guide for more details. Also, please refer to <http://infocenter.3dsystems.com/bestpractices/sls-best-practices>.

8. **Routine Maintenance:** Avoid leveling powder while purging the system. Exercise care when removing powder residue from sensitive surfaces. Powder build up should be vacuumed and oily residue should be wiped with a scratch-resistant cloth. Clean laser window with mild liquid detergent under running warm water, then clean with denatured alcohol and a dust-free lens wiping tissue. Refer to the sPro 60 HD-HS User Guide and DuraForm PP White Material Guide for more details.
9. **Material Handling:** Follow proper PPE when handling DuraForm PP White. This includes safety glasses, protective gloves, and a dust mask. Please refer to the sPro 60 HD-HS User Guide and DuraForm PP White Material Guide for more details. [Add link to infocenter SDS](#)

NOTE: Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source may become a potential dust explosion hazard. The dust deflagration value (K_{st}) is 51 bar·m/sec.

10. **Part Breakout, Powder Recycling & Sifting:** Do not remove the part cake from the process chamber until the part bed temperature is approximately 80°C. Allow parts to continue cooling to 50°C before trying to break them out of the part cake.

After a print, the powder around the parts in the part cake and the overflow powder can be sifted and reused in another print. Consistent recycling procedures are important in order to maintain consistent material properties. If recycling procedures are not followed, problems such as variable shrinkages and surface imperfections like “orange peel” may appear.

Remove loose powder surrounding the parts with a brush. Use a combination of part breakout tools and a bead blaster to fully remove the powder adhering to the parts. Sift the part cake and overflow powders prior to reusing in the next build. Sifting completed with a 310µm mesh removes undesirable particles from the used powder.

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11. **Blending Fresh and Used Powder:** A blender, such as a “V blender” is required to blend the fresh and used powder (combination of part cake and overflow) after the used powder is sifted with a 50 TBC mesh.

The recommended blend ratio for DuraForm PP White material is 20% fresh- 40% overflow- 40% part cake. Recommended duration of blending is 1.5hrs with a V blender.

NOTE: For a sPro 60 HD-HS system, the overflow powder is collected in bins to the side of the feed pistons. The feed amount has been optimized to reduce the amount of overflow while ensuring full coverage of sintered areas evenly during a build. If the percentage of sintered areas are less than 10% during a build, the left and right feed distance may be reduced from 0.262mm to a lower value in increments of 0.05mm (to a value no lower than 0.236mm). Lowering the feed will allow a taller maximum build height; however, the user must ensure sufficient feed and coverage for good part quality during the build is maintained.

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