



# Technical Data Sheet

## PLA by Innofil3D BV

Filament suitable for all commercially available leading brands 3D FDM/FFF printers

### IDENTIFICATION OF THE MATERIAL

|                 |                               |
|-----------------|-------------------------------|
| Trade name      | Innofil3D PLA                 |
| Chemical name   | Polylactic Acid               |
| Chemical family | Thermoplastic Polylactic Acid |
| Use             | 3D-Printing                   |
| Origin          | Innofil3D BV                  |

### GUIDELINE FOR PRINT SETTINGS

|                    |                          |
|--------------------|--------------------------|
| Nozzle temperature | 220 ± 10 °C              |
| Bed temperature    | Approx. 60 °C            |
| Bed modification   | Tape or glue below 60 °C |
| Active cooling fan | YES (up to 100%)         |
| Layer height       | 0.08 - 0.2 mm            |
| Shell thickness    | 0.4 - 0.8 mm             |
| Print speed        | 40 - 80 mm/s             |

Settings are based on a 0.4 mm nozzle

### MATERIAL PROPERTIES

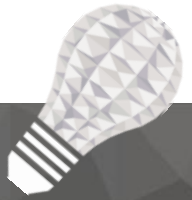
| MATERIAL PROPERTIES           |                             | Test Method |
|-------------------------------|-----------------------------|-------------|
| Melt temperature              | 145 - 160 °C                | ASTM D3418  |
| Glass transition temperature  | ~ 60 °C                     | ASTM D3418  |
| Melt Flow Rate <sup>1</sup>   | 6.09 g/10min                | ISO 1133    |
| Melt Volume Rate <sup>1</sup> | 6.73 cm <sup>3</sup> /10min | ISO 1133    |
| Density                       | 1.26 g/cm <sup>3</sup>      | ASTM D1505  |
| Odor                          | Odorless                    | /           |
| Solubility                    | Insoluble in water          | /           |

<sup>1</sup>Test conditions: T = 210 °C; m = 2.16 kg



| MECHANICAL PROPERTIES   TENSILE TEST   |                                  |            | Test Method ISO 527                  |            |
|--|----------------------------------|------------|--------------------------------------|------------|
| <p>All test specimens were printed using an Ultimaker 2+ under the following conditions:<br/>                     Printing temperature: 210 °C<br/>                     Heated bed temperature: 60 °C<br/>                     Print speed: 40 mm/s<br/>                     Number of shells: 2<br/>                     Infill under 45°</p> | <p>Printed vertical (Z-axis)</p> |            | <p>Printed horizontal (X,Y-axis)</p> |            |
|  | Infill                           | 50%        | 100%                                 | 50%        |
| Tensile strength (MPa)   | 13.6 ± 2.6                       | 28.8 ± 4.2 | 24.1 ± 0.6                           | 38.1 ± 0.9 |
| Force at break (MPa)   | 13.4 ± 2.5                       | 28.6 ± 4.1 | 23.9 ± 0.7                           | 36.3 ± 1.2 |
| Elongation at max force (%)  | 0.7 ± 0.2                        | 1.1 ± 0.3  | 2.2 ± 0.1                            | 2.1 ± 0.0  |
| Elongation at break (%)  | 0.7 ± 0.2                        | 1.1 ± 0.3  | 2.4 ± 0.1                            | 2.8 ± 0.2  |
| Relative tensile strength (MPa/g)  | 1.5 ± 0.3                        | 2.4 ± 0.4  | 2.7 ± 0.1                            | 3.3 ± 0.1  |
| E modulus (MPa)  | 2028 ± 59                        | 3150 ± 54  | 1760 ± 38                            | 2852 ± 88  |

| MECHANICAL PROPERTIES   IMPACT TEST   |                    | Test Method ISO 179 |                    |      |
|---|--------------------|---------------------|--------------------|------|
| <p>All test specimens were printed using an Ultimaker 2+ under the following conditions:<br/>                     Printing temperature: 210 °C<br/>                     Heated bed temperature: 60 °C<br/>                     Print speed: 40 mm/s<br/>                     Number of shells: 2<br/>                     Infill under 45°<br/>                     1 →: impact direction</p> | <p>Charpy (en)</p> |                     | <p>Charpy (ep)</p> |      |
|   | Infill             | 100%                | 100%               | 100% |
| Impact strength (kJ/m <sup>2</sup> )  | 14.2 ± 0.7         | 13.1 ± 0.7          | 13.1 ± 0.7         |      |
| Impact energy (mJ)  | 521.5 ± 26.8       | 501.7 ± 31.1        | 501.7 ± 31.1       |      |



| MECHANICAL PROPERTIES   FLEXURAL TEST  |                | Test Method     | ISO 178 |
|--|----------------|-----------------|---------|
| <p>All test specimens were printed using an Ultimaker 2+ under the following conditions:<br/>                     printing temperature: 210 °C<br/>                     heated bed temperature: 60 °C<br/>                     print speed: 40 mm/s<br/>                     number of shells: 2<br/>                     Infill under 45°<br/>                     1 →: bending direction</p> | <p>Normal</p>  | <p>Parallel</p> |         |
|  | Infill         | 100%            | 100%    |
| Flexural modulus (MPa)   | 2409.5 ± 206.3 | 2551.4 ± 100.8  |         |
| Maximum force (MPa)  | 65.7 ± 5.3     | 86.2 ± 3.2      |         |
| Deformation (%)  | 4.1 ± 0.2      | 3.8 ± 0.2       |         |

| FILAMENT SPECIFICATIONS       |                | Test Method |
|-------------------------------|----------------|-------------|
| Diameter 1.75                 | 1.75 ± 0.05 mm | Innofil3D   |
| Diameter 2.85                 | 2.85 ± 0.10 mm | Innofil3D   |
| Max. roundness deviation 1.75 | 0.05 mm        | Innofil3D   |
| Max. roundness deviation 2.85 | 0.10 mm        | Innofil3D   |
| Net weight on reel            | 750 g ± 2%     | Innofil3D   |



| LIST OF COLORS AND CERTIFICATIONS* |      |                     |                          |                  |                      |                      |
|------------------------------------|------|---------------------|--------------------------|------------------|----------------------|----------------------|
| Colour                             | Code | RAL nr./<br>Pantone | Certifications/approvals |                  |                      |                      |
|                                    |      |                     | 10/2011 <sup>1</sup>     | FDA <sup>2</sup> | 2011/65 <sup>3</sup> | EN 71-3 <sup>4</sup> |
| Naturel                            | 0001 | N/A                 | Yes                      | Yes              | Yes                  | Yes                  |
| Black                              | 0002 | 9005                | Yes                      | Yes              | Yes                  | Yes                  |
| White                              | 0003 | 9010                | Yes                      | Yes              | Yes                  | Yes                  |
| Red                                | 0004 | 3020                | Yes                      | <u>No</u>        | Yes                  | Yes                  |
| Blue                               | 0005 | 5002                | Yes                      | Yes              | Yes                  | Yes                  |
| Yellow                             | 0006 | 1003                | Yes                      | Yes              | Yes                  | Yes                  |
| Green                              | 0007 | 6018                | Yes                      | Yes              | Yes                  | Yes                  |
| Army Green                         | 0009 | 6003                | Yes                      | Yes              | Yes                  | Yes                  |
| Orange                             | 0009 | 2008                | Yes                      | <u>No</u>        | Yes                  | Yes                  |
| Pearl White                        | 0011 | 1013                | Yes                      | Yes              | Yes                  | Yes                  |
| Chocolate Brown                    | 0013 | 8017                | Yes                      | Yes              | Yes                  | Yes                  |
| Gold                               | 0014 | 1036                | Yes                      | Yes              | Yes                  | Yes                  |
| Light Blue                         | 0015 | 5012                | Yes                      | Yes              | Yes                  | Yes                  |
| Violet                             | 0016 | 4008                | Yes                      | Yes              | Yes                  | Yes                  |
| Apricot Skin                       | 0019 | 7415C               | Yes                      | <u>No</u>        | Yes                  | Yes                  |
| Pink                               | 0020 | N/A                 | Yes                      | <u>No</u>        | Yes                  | Yes                  |
| Silver                             | 0021 | 9006                | Yes                      | Yes              | Yes                  | Yes                  |
| Magenta                            | 0022 | 4010                | Yes                      | <u>No</u>        | Yes                  | Yes                  |
| Grey                               | 0023 | 7045                | Yes                      | <u>No</u>        | Yes                  | Yes                  |
| Bronze                             | 0032 | 8008                | Yes                      | Yes              | Yes                  | Yes                  |
| Sky Blue                           | 0035 | N/A                 | Yes                      | Yes              | Yes                  | Yes                  |
| Orange Translucent                 | 0010 | 1028**              | Yes                      | Yes              | Yes                  | Yes                  |
| Blue Translucent                   | 0024 | 5022**              | Yes                      | Yes              | Yes                  | Yes                  |
| Dark Green Translucent             | 0025 | 6005**              | Yes                      | Yes              | Yes                  | Yes                  |
| Ice Blue Translucent               | 0026 | 5024**              | Yes                      | Yes              | Yes                  | Yes                  |
| Ocean Blue Translucent             | 0027 | 5001**              | Yes                      | Yes              | Yes                  | Yes                  |

\* This overview is generated using information obtained from the raw material suppliers.

\*\* RAL number used to manufacture the (semi-)transparent colour.

| Certifications/approvals                    | Description   |
|---|---|
| <sup>1</sup> Regulation EU No 10/2011:      | Union Guidelines on Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food (Europe) |
| <sup>2</sup> FDA:                           | Food and Drug administration approval (U.S.A.)  |
| <sup>3</sup> Directive 2011/65/EU:          | The restriction of the use of certain hazardous substances in electrical and electronic equipment (Europe)                        |
| <sup>4</sup> Directive 2009/48/EC; EN 71-3: | Safety of toys - Part 3: Migration of certain elements (Europe)   |