

| General Properties                                        | FS 3300PA<br>PA1212-based powder | FS 3400GF<br>Glass bead filled | FS 3400CF<br>Carbon fiber filled |
|-----------------------------------------------------------|----------------------------------|--------------------------------|----------------------------------|
| <b>Bulk Density</b>                                       | 0.48 g/cm <sup>3</sup>           | 0.67 g/cm <sup>3</sup>         | 0.51 g/cm <sup>3</sup>           |
| <b>Part Density</b>                                       | 0.95 g/cm <sup>3</sup>           | 1.26 g/cm <sup>3</sup>         | 1.08 - 1.10 g/cm <sup>3</sup>    |
| <b>Color</b>                                              | White                            | Gray                           | Black                            |
| <b>Thermal Properties</b>                                 |                                  |                                |                                  |
| <b>Melting Point(10°C /min)</b> ISO 11357.1:1997          | 183 °C                           | 184 °C                         | 184 °C                           |
| <b>Heat Deflection Temp(HDT) @ 1.8 MPa</b> ISO 75-2:2003  | 83.5 °C                          | 88.8 °C                        | 72 °C                            |
| <b>Heat Deflection Temp(HDT) @ 0.45 MPa</b> ISO 75-2:2003 | 146.2 °C                         | 162.0 °C                       | 168 °C                           |
| <b>Mechanical Properties</b>                              |                                  |                                |                                  |
| <b>Tensile Strength</b> ISO 527.2:1993                    | 46 MPa                           | 44 MPa                         | 65-70 MPa                        |
| <b>Tensile Modulus</b> ISO 527.2:1993                     | 1602 MPa                         | 3500-7800 MPa                  | 4700 - 6500 MPa                  |
| <b>Elongation at Break</b> ISO 527.2:1993                 | 36 %                             | 5 %                            | 3.0 - 4.0 %                      |
| <b>Flexural Strength</b> ISO 178:2001                     | 46.3 MPa                         | 68MPa                          | 94 - 113 MPa                     |
| <b>Flexural Modulus</b> ISO 178:2001                      | 1300 MPa                         | 2415 MPa                       | 4500 - 5600 MPa                  |
| <b>Izod Impact Strength (notched)</b> ISO 180:2000        | 4.9 KJ/m <sup>2</sup>            | 4.6 KJ/m <sup>2</sup>          | 4.3 KJ/m <sup>2</sup>            |
| <b>Izod Impact Strength (unnotched)</b> ISO 180:2000      | 13.2 KJ/m <sup>2</sup>           | 31.1KJ/m <sup>2</sup>          | 16 KJ/m <sup>2</sup>             |

| General Properties                                        | FS 3250MF<br>Mineral fiber filled | FS 4100PA<br>PA11 powder |
|-----------------------------------------------------------|-----------------------------------|--------------------------|
| <b>Bulk Density</b>                                       | 0.55 g/cm <sup>3</sup>            | 0.49 g/cm <sup>3</sup>   |
| <b>Part Density</b>                                       | 1.20 g/cm <sup>3</sup>            | 1.03 g/cm <sup>3</sup>   |
| <b>Color</b>                                              | Light gray                        | White                    |
| <b>Thermal Properties</b>                                 |                                   |                          |
| <b>Melting Point(10°C /min)</b> ISO 11357.1:1997          | 183 °C                            | 203 °C                   |
| <b>Heat Deflection Temp(HDT) @ 1.8 MPa</b> ISO 75-2:2003  | 129 °C                            | 49 °C                    |
| <b>Heat Deflection Temp(HDT) @ 0.45 MPa</b> ISO 75-2:2003 | 171 °C                            | 150 °C                   |
| <b>Mechanical Properties</b>                              |                                   |                          |
| <b>Tensile Strength</b> ISO 527.2:1993                    | 51 MPa                            | 49 MPa                   |
| <b>Tensile Modulus</b> ISO 527.2:1993                     | 6130 MPa                          | 1542 MPa                 |
| <b>Elongation at Break</b> ISO 527.2:1993                 | 5 %                               | 58 %                     |
| <b>Flexural Strength</b> ISO 178:2001                     | 76 MPa                            | 60 MPa                   |
| <b>Flexural Modulus</b> ISO 178:2001                      | 4633 MPa                          | 1463 MPa                 |
| <b>Izod Impact Strength (notched)</b> ISO 180:2000        | 5.59 KJ/m <sup>2</sup>            | 25 KJ/m <sup>2</sup>     |
| <b>Izod Impact Strength (unnotched)</b> ISO 180:2000      | 20.78 KJ/m <sup>2</sup>           | No break                 |

# POLYMER LASER SINTERING MATERIALS

| General Properties                                                | Ultrasint X043<br>PA6 powder | Ultrasint X028<br>PA6 powder | FS 8100PPS<br>PPS powder |
|-------------------------------------------------------------------|------------------------------|------------------------------|--------------------------|
| Bulk Density                                                      | 0.52 g/cm <sup>3</sup>       | 0.52 g/cm <sup>3</sup>       | 0.57 g/cm <sup>3</sup>   |
| Part Density                                                      | 1.14 g/cm <sup>3</sup>       | 1.15 g/cm <sup>3</sup>       | 1.28 g/cm <sup>3</sup>   |
| Color                                                             | Black                        | Light yellow                 | Light yellow             |
| Thermal Properties                                                |                              |                              |                          |
| Melting Point(10°C /min) <small>ISO 11357.1:1997</small>          | 225 °C                       | 220°C                        | 295 °C                   |
| Heat Deflection Temp(HDT) @ 1.8 MPa <small>ISO 75-2:2003</small>  | 93 °C                        | 100 °C                       | 116 °C                   |
| Heat Deflection Temp(HDT) @ 0.45 MPa <small>ISO 75-2:2003</small> | 191 °C                       | 199 °C                       | 220 °C                   |
| Mechanical Properties                                             |                              |                              |                          |
| Tensile Strength <small>ISO 527.2:1993</small>                    | 74 MPa                       | 78 MPa                       | 47 MPa                   |
| Tensile Modulus <small>ISO 527.2:1993</small>                     | 3457 MPa                     | 3550 MPa                     | 3412 MPa                 |
| Elongation at Break <small>ISO 527.2:1993</small>                 | 4.0 %                        | 13.0 %                       | 3.8 %                    |
| Flexural Strength <small>ISO 178:2001</small>                     | 99 MPa                       | 121 MPa                      | 63 MPa                   |
| Flexural Modulus <small>ISO 178:2001</small>                      | 2842 MPa                     | 3300 MPa                     | 2906 MPa                 |
| Izod Impact Strength (notched) <small>ISO 180:2000</small>        | 10.5 KJ/m <sup>2</sup>       | 3.1 KJ/m <sup>2</sup>        | 2.1 KJ/m <sup>2</sup>    |
| Izod Impact Strength (unnotched) <small>ISO 180:2000</small>      | 67.2 KJ/m <sup>2</sup>       | 9.7 KJ/m <sup>2</sup>        | 5.7 KJ/m <sup>2</sup>    |

| General Properties                                                | FS 1092A-TPU<br>TPU powder | FS 1088A-TPU<br>TPU powder |
|-------------------------------------------------------------------|----------------------------|----------------------------|
| Bulk Density                                                      | 0.64 g/cm <sup>3</sup>     | 0.46 g/cm <sup>3</sup>     |
| Part Density                                                      | 1.12 g/cm <sup>3</sup>     | 1.20 g/cm <sup>3</sup>     |
| Color                                                             | White                      | White                      |
| Thermal Properties                                                |                            |                            |
| Melting Point(10°C /min) <small>ISO 11357.1:1997</small>          | 169 °C                     | 160 °C                     |
| Heat Deflection Temp(HDT) @ 1.8 MPa <small>ISO 75-2:2003</small>  | n/a                        | n/a                        |
| Heat Deflection Temp(HDT) @ 0.45 MPa <small>ISO 75-2:2003</small> | n/a                        | n/a                        |
| Mechanical Properties                                             |                            |                            |
| Tensile Strength <small>ISO 527.2:1993</small>                    | 18 MPa                     | 20 MPa                     |
| Tensile Modulus <small>ISO 527.2:1993</small>                     | 61 MPa                     | 30 MPa                     |
| Elongation at Break <small>ISO 527.2:1993</small>                 | 276 %                      | 340 %                      |
| Flexural Strength <small>ISO 178:2001</small>                     | 6.2 MPa                    | n/a                        |
| Flexural Modulus <small>ISO 178:2001</small>                      | 86 MPa                     | 27 MPa                     |
| Izod Impact Strength (notched) <small>ISO 180:2000</small>        | No break                   | No break                   |
| Izod Impact Strength (unnotched) <small>ISO 180:2000</small>      | No break                   | No break                   |

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