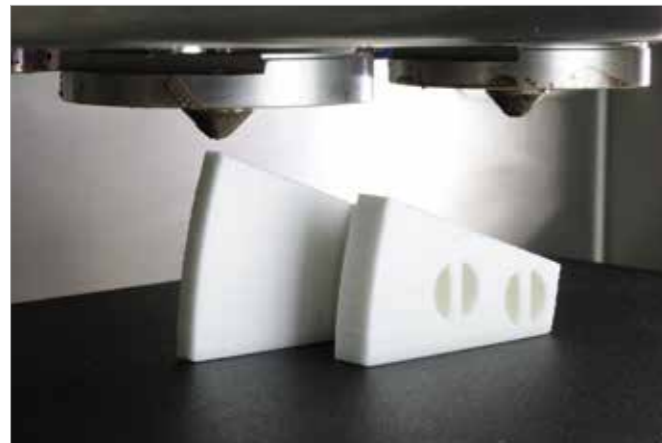




# ...plastics



### 3D printing / SLS

**For prototypes or small quantities made from tribo-filaments with the laser sintering method**

Wear-resistant materials for 3D printing and the laser sintering method – print parts yourself or have igus® print them for you.

- Up to 50 times more abrasion-resistant than conventional 3D print materials
- Various iglidur® materials available for FDM/FFF (filament) and SLS (powder)
- No tool costs; cost-effective, no minimum order quantity



### Printed tools

**For small quantities made from iglidur® granules**

3D-printed injection moulds. Wear-resistant parts with a simple geometry can be made from most iglidur® materials.

- Customised parts delivered from 4 business days
- Up to 80 % more cost-effective than conventional injection mould tools
- For prototypes and small volumes

## Lubrication-free printing

Extremely abrasion and wear-resistant tribo-plastics for additive manufacturing via selective laser sintering (SLS) or with filament (FDM/FFF) allow you to use the printed component or to test the function of the part reliably and completely from the prototype or production batch onward.

- Very high abrasion resistance
- Lubrication and maintenance-free
- No tool costs
- Design freedom
- 3D printing of parts on site
- Can be processed by commercially available 3D printers
- Predictable service life

### Typical application areas

- Special wear-resistant parts
- Jig construction
- Single pieces and small volumes



### Available from stock

Detailed information about delivery time online.



### More information about 3D printing

► [www.igus.eu/tribo-printing](http://www.igus.eu/tribo-printing)

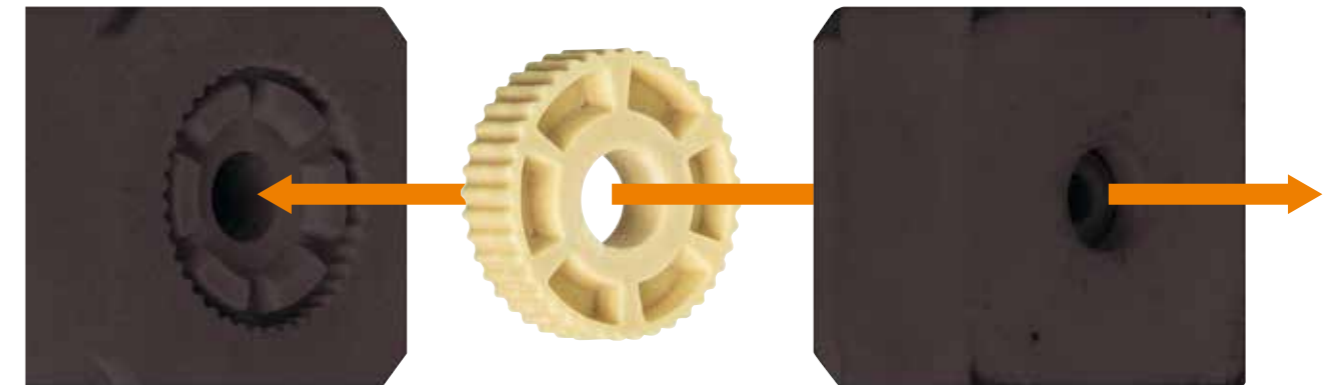


### Calculate service life online and order directly.

► [www.igus.eu/iglidur-expert](http://www.igus.eu/iglidur-expert)



Calculation of the anticipated service life, now also for the 3D printing materials iglidur® J260 (FDM) and iglidur® I6 (SLS)



### Tools for injection moulding from the 3D printers

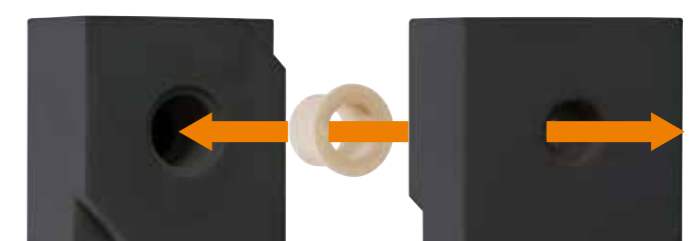
Due to 3D printing, igus® is able to make customised injection moulds in a short time with up to 80 % lower costs. Maintenance-free plastic plain bearings in the required shape can be made quickly and, above all, cost-effectively.



igus® continually tests the available iglidur® materials – talk to us to obtain further information.

The manufacture of maintenance-free plastic plain bearings from 3D printed injection moulds is worthwhile compared to direct 3D printing of the iglidur® materials especially if:

- Special material characteristics are needed, such as conductivity, high temperature, underwater use, KTW compliance
- Small volumes in the same iglidur® material are to be sampled as is a later high volume from a classic injection moulding tool



### Configure your custom iglidur® plain bearing

- Configure your required iglidur® plain bearing and thrust washer
- Any dimension, 1–170mm
- Minimum wall thickness: 0.7mm

- Use plain bearings immediately without any rework
- Clearance after press-fit: 0.03–0.23mm
- [www.igus.eu/3d-model](http://www.igus.eu/3d-model)



Delivery time  
from 4 business days



[www.igus.eu/3d-tools](http://www.igus.eu/3d-tools)

# iglidur® SLS | Laser sintering

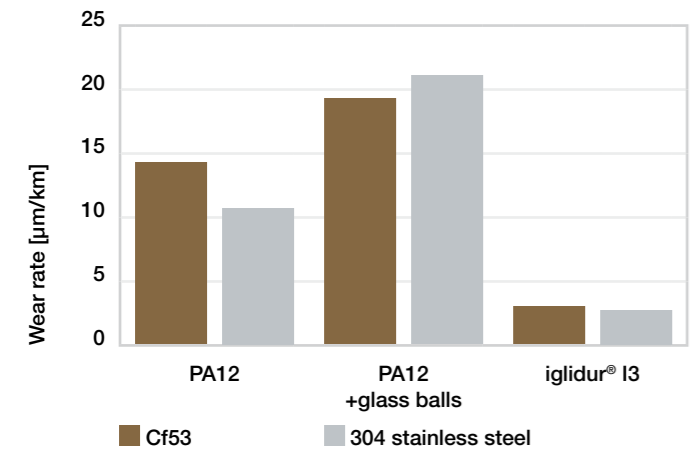
## iglidur® I3 for 3D printing via SLS



### At least 3 times more wear-resistant: iglidur® I3 for 3D printing via SLS

The material iglidur® I3, specially developed for laser sintering, proved to have an abrasion resistance at least 3 times higher than conventional materials for laser sintering during tribological tests in the igus® test laboratory. This means the degree of design freedom for wear-resistant parts has been further increased.

- Lubrication and maintenance-free
- Wear-resistant
- Good mechanical properties
- Detail accuracy with exact surfaces
- Can be processed using the standard parameter set
- Refresh rate: 75 %
- Compliant according to FMV SS 302



Rotating wear: p = 1MPa; v = 0.3m/s

### Material properties

General properties	Unit	iglidur® I3	Testing method
Density	g/cm³	1.05	
Colour		yellow	
Max. moisture absorption at +23 °C/50 % r. h.	% weight	0.8	DIN 53495
Max. total moisture absorption	% weight	1.9	
Mechanical properties			
Flexural modulus	MPa	1,400	DIN 53457
Flexural strength at +20 °C	MPa	68/61 <sup>130)</sup>	DIN 53452
Shore D hardness		70	DIN 53505
Physical and thermal properties			
Max. continuous application temperature	°C	+80	
Max. short-term application temperature	°C	+140	
Min. continuous application temperature	°C	−40	
Electrical properties			
Specific contact resistance	Ωcm	> 10 <sup>12</sup>	DIN IEC 93
Surface resistance	Ω	> 10 <sup>11</sup>	DIN 53482

<sup>130)</sup> Printed flat/upright

► Chemical table, **page 1542**

**Part No. raw material (10 kg)**  
**I3-PL-10000**

**Delivery time**  
**5 days**



# iglidur® SLS | Laser sintering

## iglidur® I6 for 3D printing via SLS

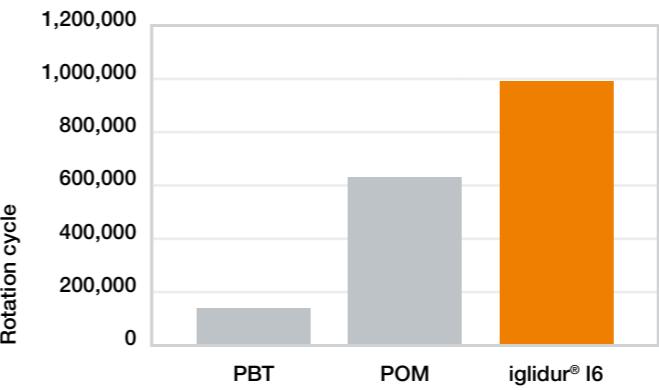


### Durable gears made of iglidur® I6 via laser sintering

The material iglidur® I6 was specifically developed for laser sintering for use as a gear. The tests in the igus® test laboratory showed a longer service life than conventional - e.g. machined POM gears. This greatly increases the flexibility in the design of gears, since no tools are necessary due to the laser sintering process and gears can be produced efficiently without minimum order quantity.

- Abrasion-resistant
- Extremely long operating times
- Lubrication and maintenance-free
- Cost-efficient from batch size 1
- No tool costs
- Delivery time 24 hrs to 3 days
- Detail accuracy with exact surfaces
- Also suitable for medium-sized series, e.g. 5,000 pieces

► [www.igus.eu/gear](http://www.igus.eu/gear)



Service life test worm wheel. 12 rpm; 4.9 Nm

### Material properties

General properties	Unit	iglidur® I6	Testing method
Density	g/cm³	1.06	
Colour		white	
Max. moisture absorption at +23 °C/50 % r. h.	% weight	0.8	DIN 53495
Max. total moisture absorption	% weight	1.9	
Mechanical properties			
Flexural modulus	MPa	1,100	DIN 53457
Flexural strength at +20 °C	MPa	49/38 <sup>130)</sup>	DIN 53452
Shore D hardness		67	DIN 53505
Physical and thermal properties			
Max. continuous application temperature	°C	+80	
Max. short-term application temperature	°C	+140	
Min. continuous application temperature	°C	−40	
Electrical properties			
Specific contact resistance	Ωcm	> 10 <sup>12</sup>	DIN IEC 93
Surface resistance	Ω	> 10 <sup>11</sup>	DIN 53482

<sup>130)</sup> Printed flat/upright

► Chemical table, **page 1542**

**Delivery time**  
**1–3 days**





### Wear-resistant parts from the 3D printing service:


#### Online and extremely fast


Printed parts extremely wear-resistant – as prototype or in small series. Simply upload your required part, determine the price and order online (or ask for a quotation). Thanks to the iglidur® 3D printing service, from now on 2 quick and easy steps will fetch home your customised component made of lubrication-free and abrasion-resistant iglidur® plastics.

- 1 Go to **www.igus.eu/3dprintservice** and upload the 3D model in the STEP format
  - 2 Select material and quantity and order the component or ask for a quotation
- **Your individual wear-resistant part will be shipped in 3 days**

### SLS can also be used to make wear-resistant parts

The 3D printing service is being extended with the materials iglidur® I3 and iglidur® I6. Laser sintering (SLS) is used to make parts of these materials. Even more plain bearing applications are therefore possible with 3D-printed parts as strength and precision are considerably greater if this method is used.

 **Delivery time**  
From 24hrs up to 3 business days

 **Try it out now:**  
[www.igus.eu/3dprintservice](http://www.igus.eu/3dprintservice)

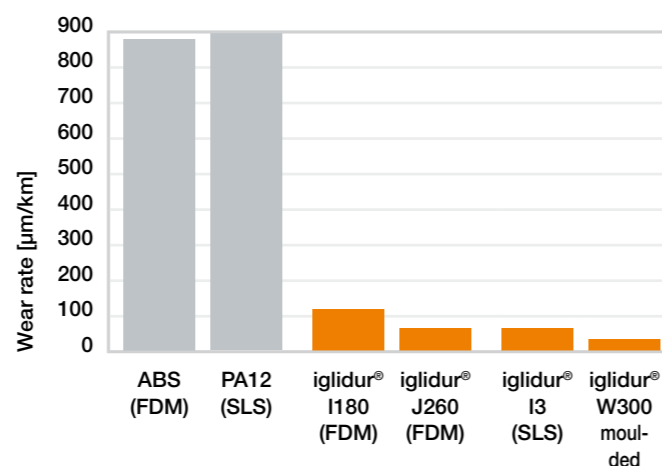
### Dimensional stability and size of installation space

The precision of the printed parts in the case of the iglidur® tribo-filaments is  $\pm 0.2\text{mm}$  (up to an edge length of 50mm, above this  $\pm 0.4\%$ ). In the case of parts made using the laser sintering process the precision is  $\pm 0.1\text{mm}$  (up to an edge length of 50mm, above this  $\pm 0.2\%$ ).

The space used for processing the iglidur® tribo-filaments measures 135x145x200mm. In the case of laser sintering the space used measures 170x220x300mm. The following applies to both processes: larger parts may have to be made of several pieces.

In order to ensure that the 3D-printed components function correctly, the following should be included in the 3D model:

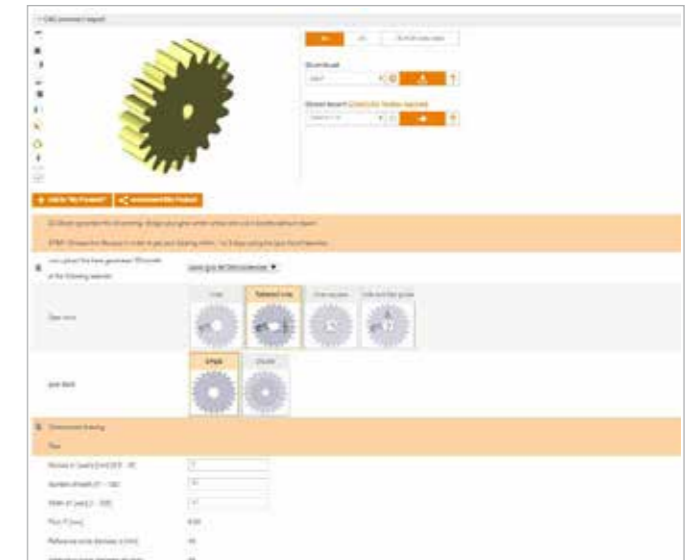
- The 3D model should be at the centre of tolerance; e.g. for a tolerance of  $16 -0.2\text{mm}$ , the 3D model should correspond to 15.9mm
- In the case of clearance fits, a clearance of approximately 0.1mm should be planned



Wear, rotating p = 20MPa; v = 0.01m/s, 304 stainless steel


### Configure your custom gear in 60 seconds and it will be ready for shipment in 3 days

In order to facilitate the work of designers, igus® has now developed a simple and practical tool with the gear configurator. This allows each customer to configure his/her own gears even in special dimensions. In a few steps, the user only needs to enter the specifications of the required gear; such as the tooth module, number of teeth, width and inner diameter. This automatically displays a 3D model that can be exported as a STEP file. If the file is uploaded in the framework of the igus® 3D printing service ([www.igus.eu/3dprintservice](http://www.igus.eu/3dprintservice)), the configured gear made of the new durable SLS material iglidur® I6 for gears can be ordered immediately from igus®. With a mouse click, the user can order his/her wear-resistant gear with no minimum order quantity or request a quotation. In just three days the custom-made gear made from the wear-resistant material iglidur® I6 is ready for shipment.

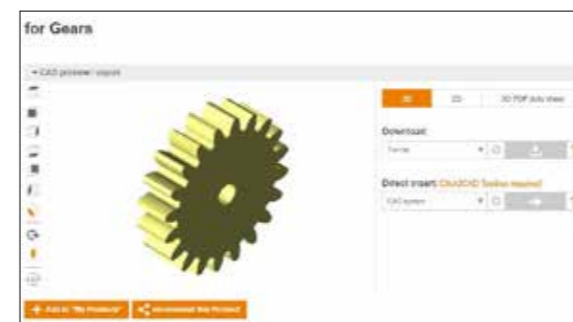


### Double the service life

In the test, iglidur® I6 showed itself to be considerably better than machined gears. Gears made of POM had total wear after 621,000 cycles, while machined PBT gears already broke after 155,000 cycles, whereas gears made of iglidur® I6 continued to be functional after more than 1 million cycles.

 **Delivery time**  
3 business days

 **Online CAD configurator for gears:**  
[www.igus.eu/gear](http://www.igus.eu/gear)




**POM**  
321,000 cycles  
High wear



**POM**  
621,000 cycles  
Failed




**iglidur® I6**  
1 million cycles  
Low wear

 **Online CAD configurator for plain bearings:**  
[www.igus.eu/3d-model](http://www.igus.eu/3d-model)



## 3D printing with tribo-filaments

**50 times more abrasion-resistant than standard materials for maximum service life**  
Components made of igus® tribo-filament are up to 50 times more wear-resistant than standard materials for 3D printing and therefore have an extremely long service life. Due to their excellent tribological properties, they are suited for 3D printing of replacement parts for e.g. plain bearings, drive nuts, gears and other wear-resistant parts. The igus® tribo-filaments can be processed on 3D printers that are based on the fused-deposition-modelling method (FDM/FFF) and that allow the nozzle temperature to be set as required.

 Find and order the appropriate tribo-filament online  
► [www.igus.eu/tribofilament](http://www.igus.eu/tribofilament)



### "How do I assess myself and my 3D printer?"

Ambient temperature of application	Beginner "Nothing can go wrong"	Advanced "Everything is usually ok"	Expert "I know what I am doing"
-30 °C to +65 °C	iglidur® I150	iglidur® I150 iglidur® I180	iglidur® I180 / iglidur® J260 iglidur® I170
-40 °C to +80 °C	iglidur® I180	iglidur® I180	iglidur® I180 / iglidur® J260 iglidur® I170
-30 °C to +100 °C			iglidur® J260 iglidur® C210
-100 °C to +120 °C			iglidur® J260



**Material: iglidur® I150**  
**Wear-resistant parts printed the easy way**

- High abrasion resistance at low speeds
- Good mechanical properties
- The easiest to process tribo-filament (even without a heated print bed)
- Nozzle temperature: +240–250 °C

► Page 676



**Material: iglidur® J260**  
**Extremely long service life and excellent coefficient of friction**

- Outstanding abrasion resistance of tribo-filaments
- Application temperature from -100 °C to +120 °C
- High-quality processing
- Nozzle temperature: +260–270 °C

► Page 678



**Material: iglidur® C210**  
**Resistant to chemicals and highly abrasion-resistant during printing**

- High chemical resistance
- Abrasion-resistant
- High-quality processing
- Nozzle temperature: +260–270 °C

► Page 680



**Material: iglidur® I180**  
**Best combination of ability to be processed and service life**

- Abrasion-resistant
- Good mechanical properties
- Nozzle temperature: +250–260 °C
- Also in black (iglidur® I180-BL)

► Page 677



**Material: iglidur® I170**  
**Longer service life**

- Improved abrasion resistance
- High-quality processing
- Nozzle temperature: +240–260 °C

► Page 679

# iglidur® tribo-filament | Tested

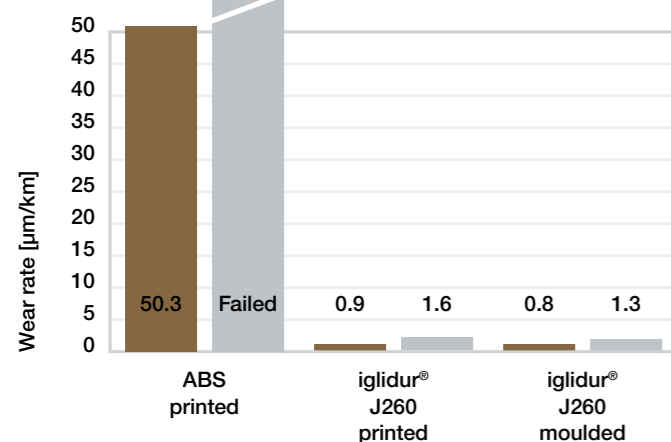
Printed as good as injection-moulded

## 3D print filament impresses during tests with injection moulding quality

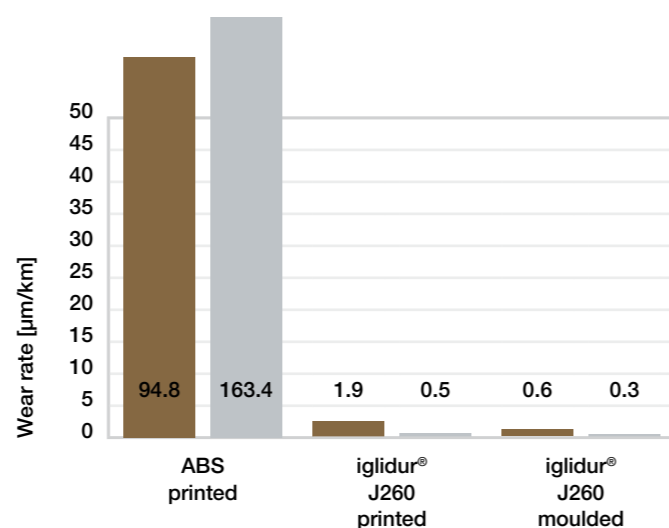
Our iglidur® J260 tribo-filament is more wear-resistant than standard print material. Our series of tests show: printed plain bearings from our latest filament iglidur® J260 are equally as wear-resistant as our injection-moulded parts from the same material. The tests have also proven that iglidur® 3D print filaments have a considerably lower coefficient of friction and are up to 50 times more abrasion-resistant than conventional 3D printing materials.

This makes iglidur® tribo-filaments the only 3D printing materials to also offer impressive performance in moving applications. You can therefore directly install printed parts such as plain bearings, drive nuts or worm gears and use them as wear-resistant parts – from the prototype phase to series production.

- Outstanding abrasion resistance of tribo-filaments
- Application temperature from –100 °C to +120 °C
- High-quality processing
- Available as filament, bar stock or injection-moulded part – **from prototype to series production**



Rotating wear: p = 1MPa; v = 0.3m/s

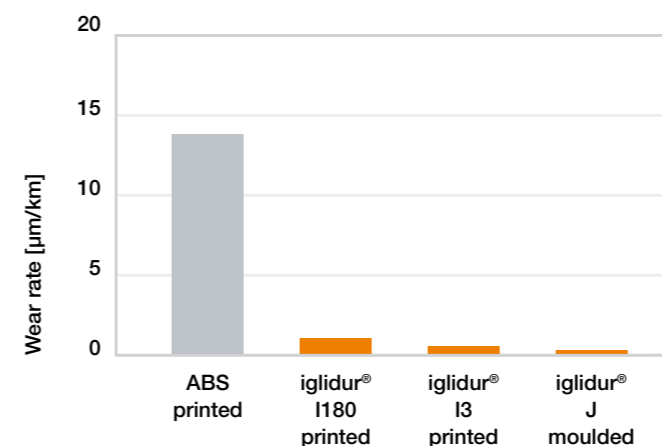


Linear wear: p = 1MPa; v = 0.3m/s; l = 5mm

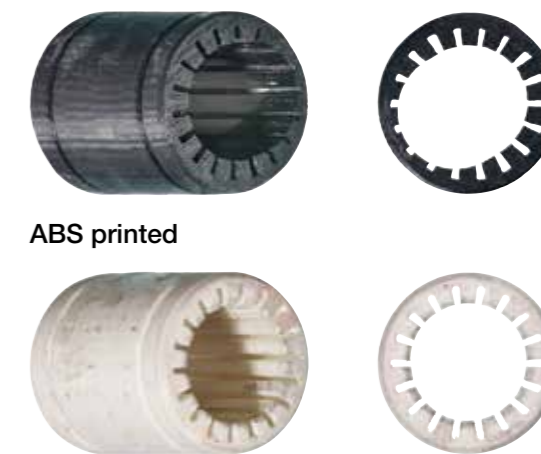
# iglidur® tribo-filament | Test results

Wear-resistant parts made of iglidur® tribo-filament with the 3D printing method or parts made of iglidur® I3 with the SLS method are much more wear-resistant than standard 3D printing materials.

The following tests also show "printed as good as injection-moulded": the 3D-printed iglidur® plain bearings are comparable to conventionally made plain bearings with respect to wear resistance.

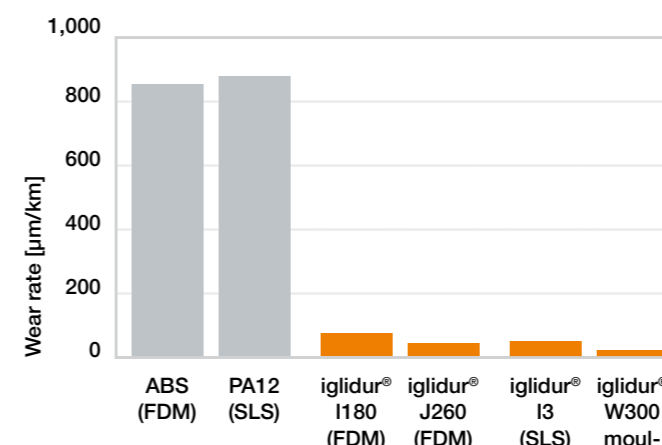


Linear wear: p = 0.11MPa; v = 0.34m/s; l = 370mm



ABS printed

iglidur® I180 printed



Wear, rotating p = 20MPa; v = 0.01m/s, 304 stainless steel

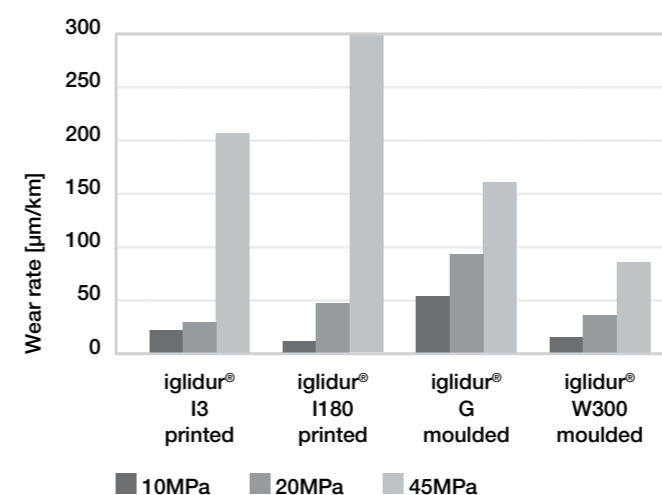


ABS

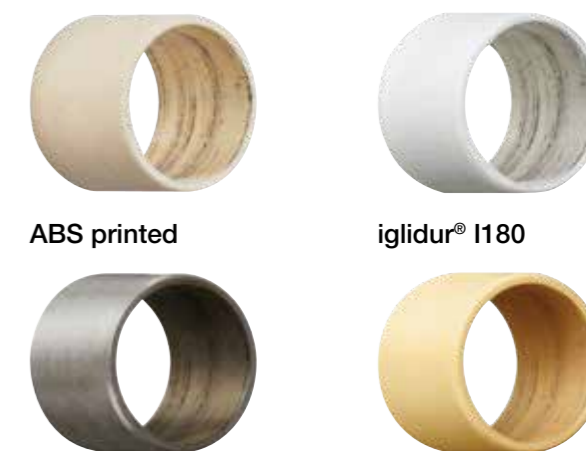
PA12

iglidur® I3

iglidur® I180



Wear, pivoting shaft: 304 stainless steel, v = 0.01m/s; β = 60°



ABS printed

iglidur® I180

iglidur® I180 printed

iglidur® W300



Order key

tribo-filament	Diameter	Weight	
I150-PF-	0175	-0250	
iglidur® material	tribo-filament	Ø [mm · 100]	Spool weight [g]

iglidur® I150 – makes printing even easier

- High abrasion resistance at low speeds
- Good mechanical properties
- The tribo-filament that is easiest to process
- Recommended printing surface: igus® adhesive film or glue-stick on glass
- Also to be processed without a heated print bed (prerequisite: igus® adhesive film ► Page 681)

Dimensions [mm]

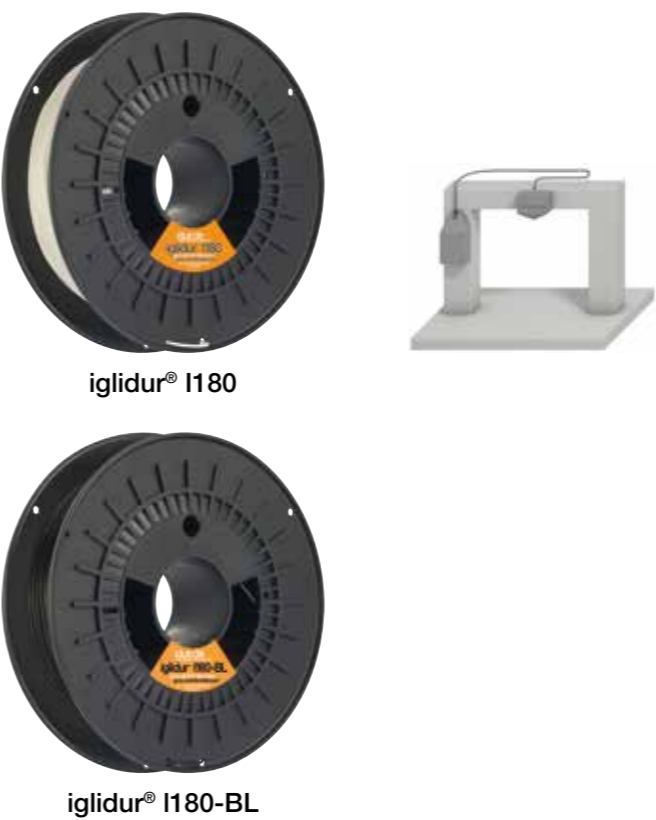
Filament diameter	Outer Ø spool	Inner Ø spool	Spool width	Weight [g]	Part No.
1.75	205	55	55	250	I150-PF-0175-0250
1.75	205	55	67	750	I150-PF-0175-0750
3.00	205	55	55	250	I150-PF-0300-0250
3.00	205	55	67	750	I150-PF-0300-0750

Material properties

General properties	Unit	iglidur® I150	iglidur® I180	iglidur® I180-BL
Density	g/cm³	1.30	1.21	1.21
Colour		white	white	black
Max. moisture absorption at +23 °C/50 % r. h.	% weight	0.3	0.3	0.3
Max. total moisture absorption	% weight	0.7	0.9	0.9
Mechanical properties				
Flexural modulus	MPa	1,700	1,700	1,700
Flexural strength at +20 °C	MPa	54/37 <sup>130)</sup>	46/33 <sup>130)</sup>	46/33 <sup>130)</sup>
Shore D hardness		62	66	66
Physical and thermal properties				
Max. continuous application temperature	°C	+65	+80	+80
Max. short-term application temperature	°C	+75	+90	+90
Min. continuous application temperature	°C	–30	–40	–40
Electrical properties				
Specific contact resistance	Ωcm	> 10 <sup>13</sup>	> 10 <sup>12</sup>	> 10 <sup>12</sup>
Surface resistance	Ω	> 10 <sup>12</sup>	> 10 <sup>11</sup>	> 10 <sup>11</sup>

Table 01: Material properties table

<sup>130)</sup> Printed flat/upright



Order key

tribo-filament	Diameter	Weight	
I180-PF-	0175	-0250	
iglidur® material	tribo-filament	Ø [mm · 100]	Spool weight [g]

iglidur® I180 – flexible

- High degree of abrasion resistance, even in the case of dynamic applications
- Good mechanical properties
- Max. application temperature: +80 °C
- Recommended printing surface: igus® adhesive film ► Page 681

iglidur® I180-BL – for visible parts

- In black for visible parts
- Same mechanical and tribological properties as iglidur® I180 in white

Dimensions [mm]

Filament diameter	Outer Ø spool	Inner Ø spool	Spool width	Weight [g]	Part No.
1.75	205	55	55	250	I180-PF-0175-0250
1.75	205	55	67	750	I180-PF-0175-0750
3.00	205	55	55	250	I180-PF-0300-0250
3.00	205	55	67	750	I180-PF-0300-0750
1.75	205	55	55	250	I180-BL-PF-0175-0250
1.75	205	55	67	750	I180-BL-PF-0175-0750
3.00	205	55	55	250	I180-BL-PF-0300-0250
3.00	205	55	67	750	I180-BL-PF-0300-0750

Processing and accessories  
► Page 681

Complete processing instructions  
online ► [www.igus.eu/tribofilament](http://www.igus.eu/tribofilament)

Part No. adhesive film for print bed  
PF-01-0203-0203 (203 x 203mm)  
PF-01-0254-0228 (254 x 228mm)



Order key

tribo-filament	Diameter	Weight
J260-PF-	0175	-0250
iglidur® material	tribo-filament	Ø [mm · 100]
		Spool weight [g]

iglidur® J260 – extremely long service life

- Outstanding abrasion resistance of tribo-filaments
- Application temperature from –100 °C to +120 °C
- For experts: high-quality processing
- Recommended printing surface:  
igus® adhesive film ► **Page 681**

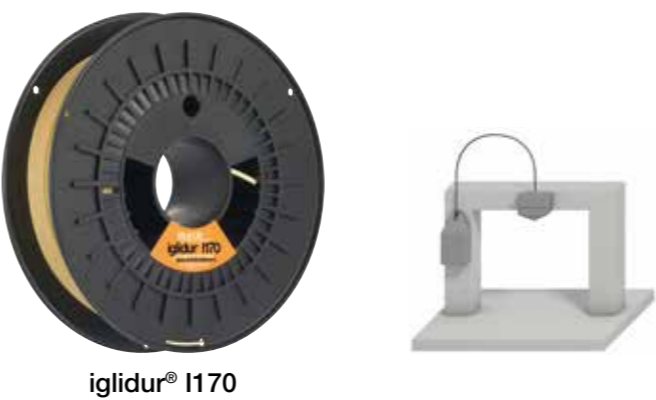
Dimensions [mm]

Filament diameter	Outer Ø spool	Inner Ø spool	Spool width	Weight [g]	Part No.
1.75	205	55	55	250	J260-PF-0175-0250
1.75	205	55	67	750	J260-PF-0175-0750
3.00	205	55	55	250	J260-PF-0300-0250
3.00	205	55	67	750	J260-PF-0300-0750

Material properties

General properties	Unit	iglidur® J260	iglidur® I170
Density	g/cm³	1.35	1.21
Colour		yellow	yellow
Max. moisture absorption at +23 °C/50 % r. h.	% weight	0.2	0.5
Max. total moisture absorption	% weight	0.4	1.6
Mechanical properties			
Flexural modulus	MPa	1,000	1,000
Flexural strength at +20 °C	MPa	41/13 <sup>130)</sup>	33/17 <sup>130)</sup>
Shore D hardness		66	64
Physical and thermal properties			
Max. continuous application temperature	°C	+120	+75
Max. short-term application temperature	°C	+140	+85
Min. continuous application temperature	°C	–100	–40
Electrical properties			
Specific contact resistance	Ωcm	> 10 <sup>12</sup>	> 10 <sup>12</sup>
Surface resistance	Ω	> 10 <sup>10</sup>	> 10 <sup>11</sup>

Table 01: Material properties table <sup>130)</sup> Printed flat/upright



Order key

tribo-filament	Diameter	Weight
I170-PF-	0175	-0250
iglidur® material	tribo-filament	Ø [mm · 100]
		Spool weight [g]

iglidur® I170 – optimised service life

- Improved abrasion resistance
- Application temperature: +80 °C
- For experts: high-quality processing
- Recommended printing surface:  
igus® adhesive film ► **Page 681**

Dimensions [mm]

Filament diameter	Outer Ø spool	Inner Ø spool	Spool width	Weight [g]	Part No.
1.75	205	55	55	250	I170-PF-0175-0250
1.75	205	55	67	750	I170-PF-0175-0750
3.00	205	55	55	250	I170-PF-0300-0250
3.00	205	55	67	750	I170-PF-0300-0750



Processing and accessories  
► **Page 681**



Complete processing instructions  
online ► [www.igus.eu/tribofilament](http://www.igus.eu/tribofilament)



Part No. adhesive film for print bed  
PF-01-0203-0203 (203 x 203mm)  
PF-01-0254-0228 (254 x 228mm)



Order key

tribo-filament	Diameter	Weight
C210-PF-	0175	-0250
iglidur® material	tribo-filament	Ø [mm · 100]
		Spool weight [g]

iglidur® C210 – chemicals and high abrasions resistance

- Resistance to many acids, solvents and hydrogen
- Abrasion-resistant
- Max application temperature: +100 °C
- For experts: high-quality processing
- Recommended printing surface:  
igus® adhesive film ► **Page 681**

Dimensions [mm]

Filament diameter	Outer Ø spool	Inner Ø spool	Spool width	Weight [g]	Part No.
1.75	205	55	55	250	C210-PF-0175-0250
3.00	205	55	55	250	C210-PF-0300-0250

Material properties

General properties	Unit	iglidur® C210
Density	g/cm³	1.40
Colour		white
Max. moisture absorption at +23 °C/50 % r. h.	% weight	0.3
Max. total moisture absorption	% weight	0.7
Mechanical properties		
Flexural modulus	MPa	1,600
Flexural strength at +20 °C	MPa	38/30 <sup>130)</sup>
Shore D hardness		70
Physical and thermal properties		
Max. continuous application temperature	°C	+100
Max. short-term application temperature	°C	+180
Min. continuous application temperature	°C	–30
Electrical properties		
Specific contact resistance	Ωcm	> 10 <sup>13</sup>
Surface resistance	Ω	> 10 <sup>12</sup>

Table 01: Material properties table <sup>130)</sup> Printed flat/upright

Processing instructions

iglidur® tribo-filaments can be processed on any 3D printer that is equipped with a heated print bed on which temperatures are adjustable. The igus® adhesive film allows a good adhesion between the iglidur® tribo-filament and the print bed.

- Good ventilation should be provided during processing
- When heated above +300 °C, hazardous fumes are produced

igus® print bed film for your print bed

Thanks to the film available from igus® for the print bed, there is very good adhesion between the iglidur® tribo-filament and the print bed.

- Useable up to approximately 20 times
- "Set" the degree of adhesion by means of print bed temperature
- 3D printer without heating bed? The combination of iglidur® I150 with this print bed film also makes it possible to make wear-resistant parts oneself with such 3D printers

Spool

250g of iglidur® tribo-filaments are wound onto a spool with an outer diameter of 205mm, a width of 55mm. It has an inner diameter of 55mm. Test kits with 25g filament are also available; this is not wound onto a spool.

Filament thickness

The iglidur® tribo-filaments are available with 1.75mm and 3mm thickness. The 3mm filaments can be used without problems in 3D printers that need a 2.85mm filament.

3x more material

With the bigger spool size, each spool contains 750g filament (300m filament in 1.75mm diameter or 90m filament in 3mm diameter).



Example: Part No. tribo-filaments

**I150-PF-0175-0250**  
for 250g spool with a diameter of 1.75mm made of the iglidur® material I150



Complete processing instructions online ► [www.igus.eu/tribofilament](http://www.igus.eu/tribofilament)



Part No. adhesive film for print bed

**PF-01-0203-0203 (203 x 203mm)**  
**PF-01-0254-0228 (254 x 228mm)**



Example: Part No. test kits

**I150-PF-0175-0025**  
for 25g of filament, loose with 1.75mm diameter made of the iglidur® material I150

