RMN® ADDITIVE

Road to Additive Manufacturing

Complete Guide to 3D Printing

additive.reiman.pt

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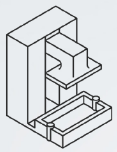
Index

This catalog contains not only information about RMN ADDITIVE's services but also a set of technical considerations about 3D Printing.

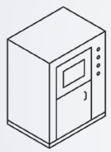
Thus, after the technical introductory section, our range of technologies and finishes is presented, including design guidelines and data sheets.

We make every effort to maintain the accuracy and quality of information provided in this document. However, we cannot guarantee or assume any legal responsibility or liability for the completeness and integrity of the content, especially due to typing or printing errors.

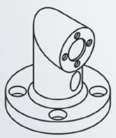
The information presented in this catalog is for general guidance only, and the customer should seek appropriate professional advice, taking into account the specifics of this project.



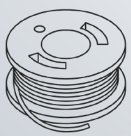
3 Technologies



+ 60 Machines



+ 200k Parts per year



+ 20 Materials

01. Ideation

Future-oriented development will lead to better products.

02. Development

Technology-independent provider. We work out a forward-driven manufacturing solution providing with the best possible results.

03. Rapid Manufacturing

Combined experience, know-how and a state-of-the-art fleet of machines allow us to significantly reduce the product development cycle and time to market.

04. From Prototype to Series Production

Our flexible production model allows us to manufacture a wide range of parts, being it a prototype or a series production.

SLS

Selective Laser Sintering

The production of SLS involves sintering a polymeric powder, layer by layer, using one or more lasers. This technology is capable of producing extremely complex parts with great detail.

Robotics

General tooling

And many others

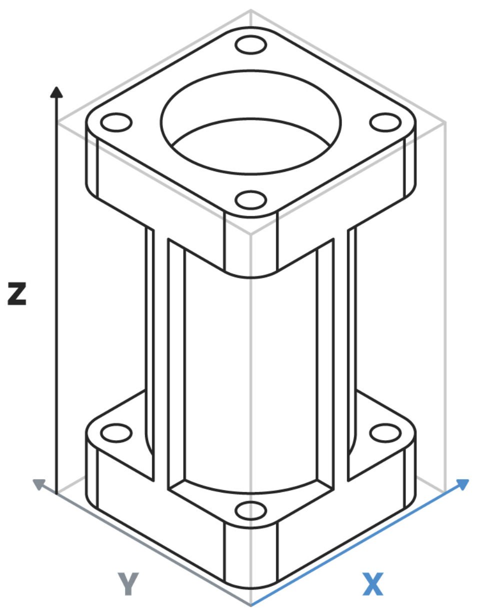
SLS

Design Guidelines

Reference Dimensions

Maximum part size

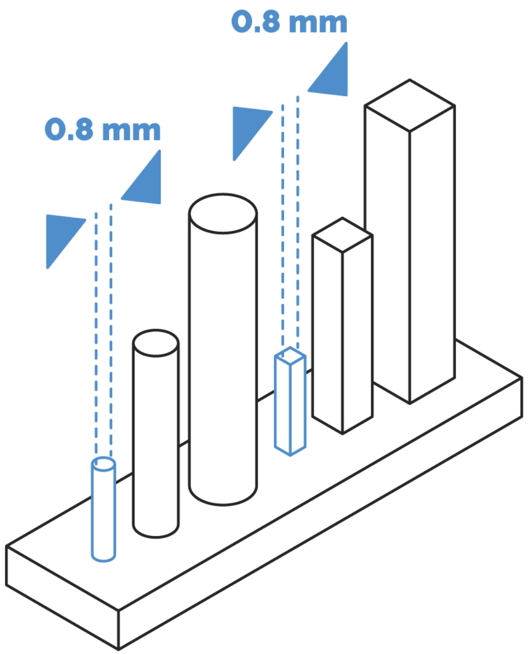
Maximum dimensions considering the production volume. Parts, even within the range shown, must be analyzed due to possible limiting geometric details.



	Width	Length	Height
EON PA12	150 mm	150 mm	280 mm
EON PA12-GF	150 mm	150 mm	280 mm

Minimum Diameter/Side (Pillars)

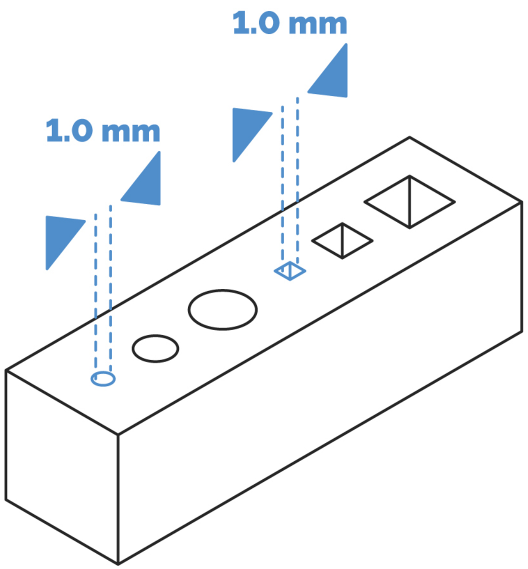
The minimum size of the pillar is the smallest dimension that can be successfully printed. The height of the pillar in relation to its dimension is a variable that must also be controlled in order to prevent this structure from becoming too weak. Therefore, a pillar should not be higher than five times the dimension of the pillar base.



Note: In order to avoid brittle areas when post-processing the parts, at these base-pillar connection locations, add a fillet or a chamfer.

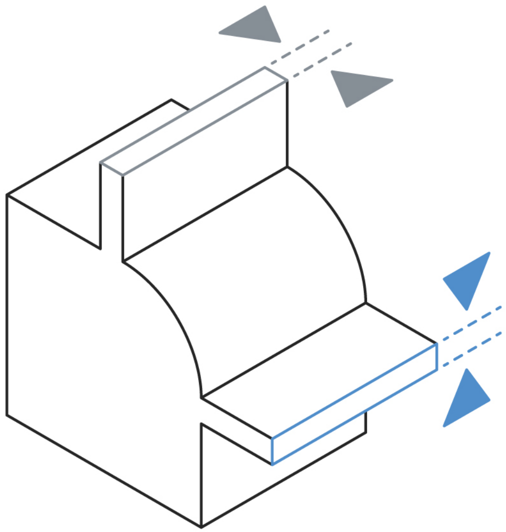
Minimum Diameter/Side (Holes)

Holes with a diameter of less than 1.0 mm may close during printing. The same is true for square holes with sides less than 1.0 mm.



Minimum unsupported walls thickness

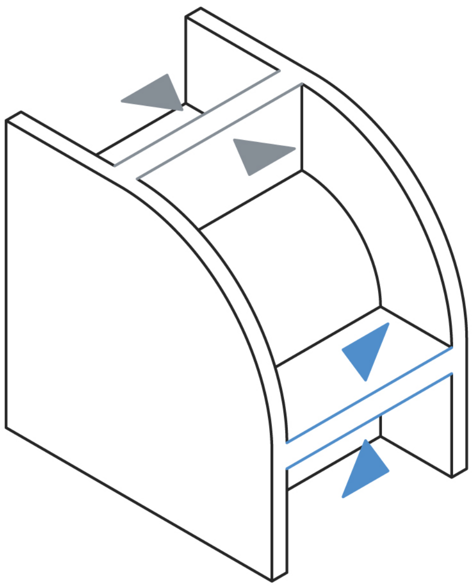
The minimum unsupported wall thickness is the minimum thickness required for a wall supported on less than two sides. Walls that are too thin may warp or separate from the model.



	Thickness
Vertical Walls	0,6 mm
Horizontal Walls	0,3 mm

Minimum supported walls thickness

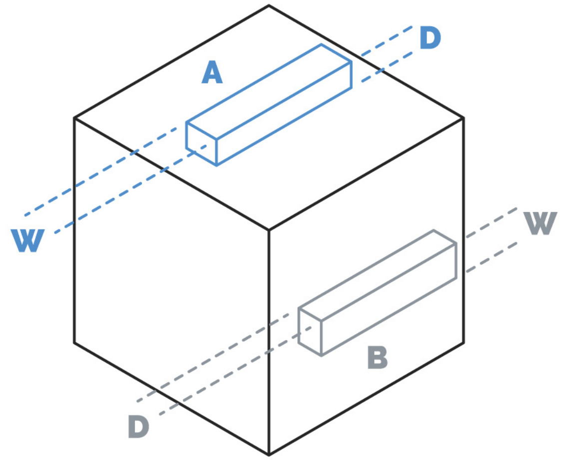
The minimum supported wall thickness is the minimum thickness required for a wall supported on two or more sides. Walls that are too thin may warp or separate from the model.



	Thickness
Vertical Walls	0,6 mm
Horizontal Walls	0,3 mm

Minimum embossed features

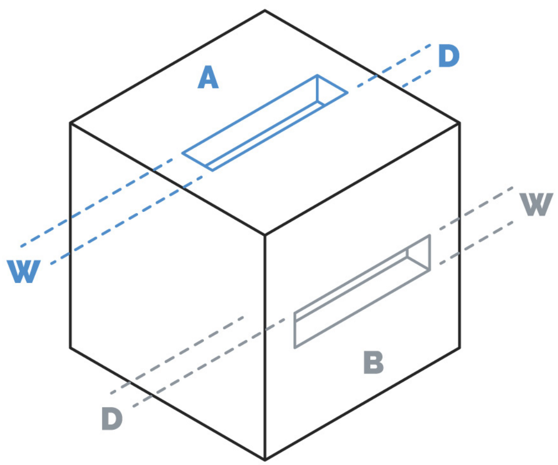
Embossed details are extruded from the faces of the model. Too small embosses can become almost or completely unnoticeable. When this feature is associated with a font (text or numerical elements), use a bold font as it enhances the results.



	Depth	Width
A) Horizontal Faces	0,15 mm	0,35 mm
B) Vertical Faces	0,35 mm	0,40 mm

Minimum engraved features

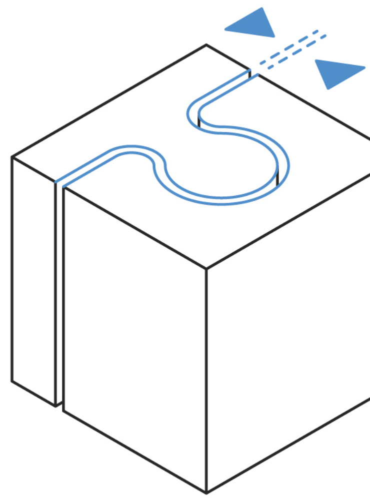
Engraved details are cuts made from the surface of the model. Details that are too small can become almost or completely unnoticeable. When this cut is associated with a font (text or numerical elements), use a bold font as it enhances the results.



	Depth	Width
A) Horizontal Faces	0,10 mm	0,30 mm
B) Vertical Faces	0,15 mm	0,35 mm

Minimum assembly tolerances

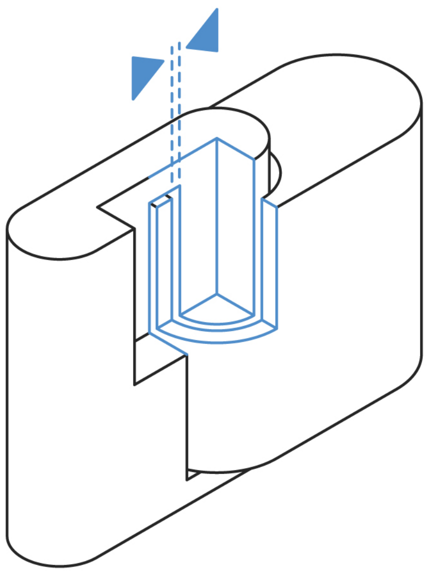
Leave a slight gap between the parts that are printed and that will have some connection between them, such as gaskets or gears.



Contact area less than or equal to 20 mm²	0,2 mm
Contact area greater than 20 mm²	0,4 mm

Integrated assembly tolerances

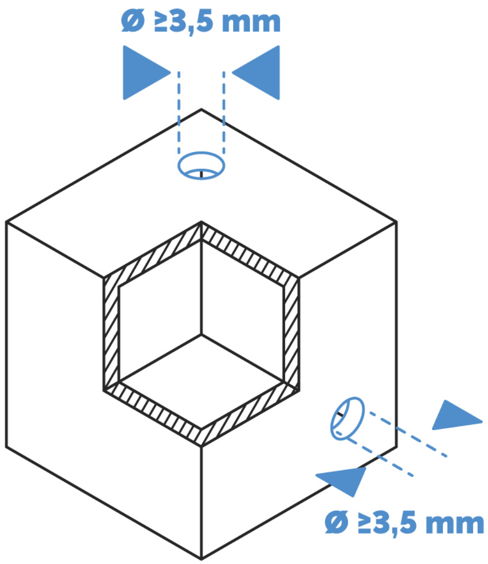
For parts that will be printed together in an assembly, free space must be left to prevent the parts from merging together.



Contact area less than or equal to 20 mm²	0,3 mm
Contact area greater than 20 mm²	0,6 mm

Escape holes

Closed cavities do not allow the non-sintered powder to be extracted from inside, without exhaust holes. For best results, include at least 2 escape holes in the cavity. These holes should have a diameter of 3.5 mm or more.



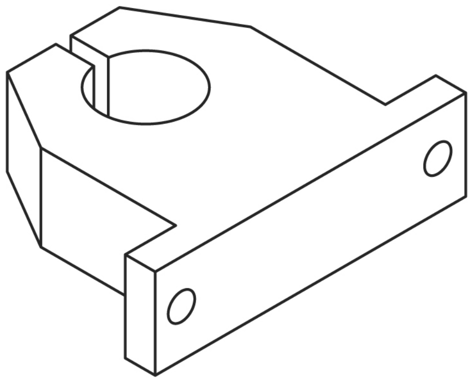
SLS

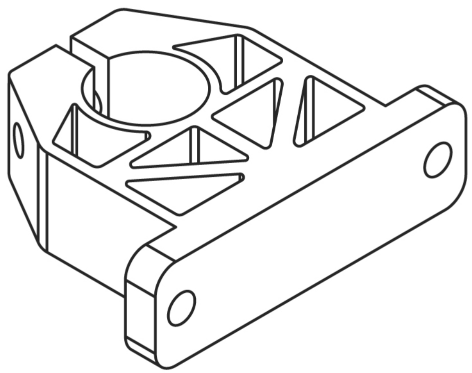
Design Guidelines

Design Considerations

Maintaining uniform thickness

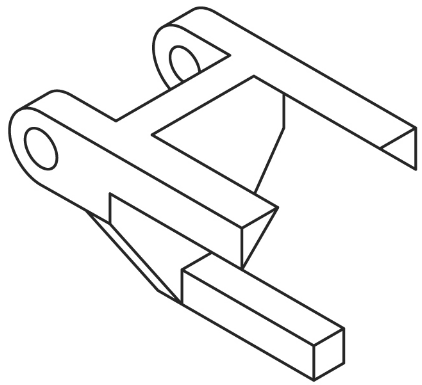
Whenever possible, keep the thickness of the parts relatively consistent. This will alleviate issues related to warping.

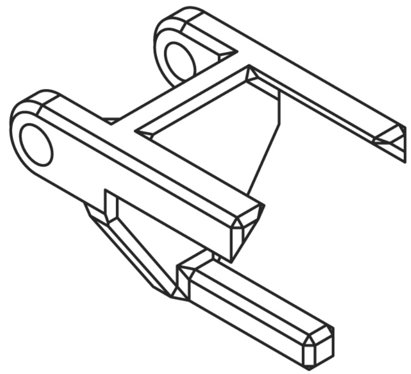




Reducing stress concentrations

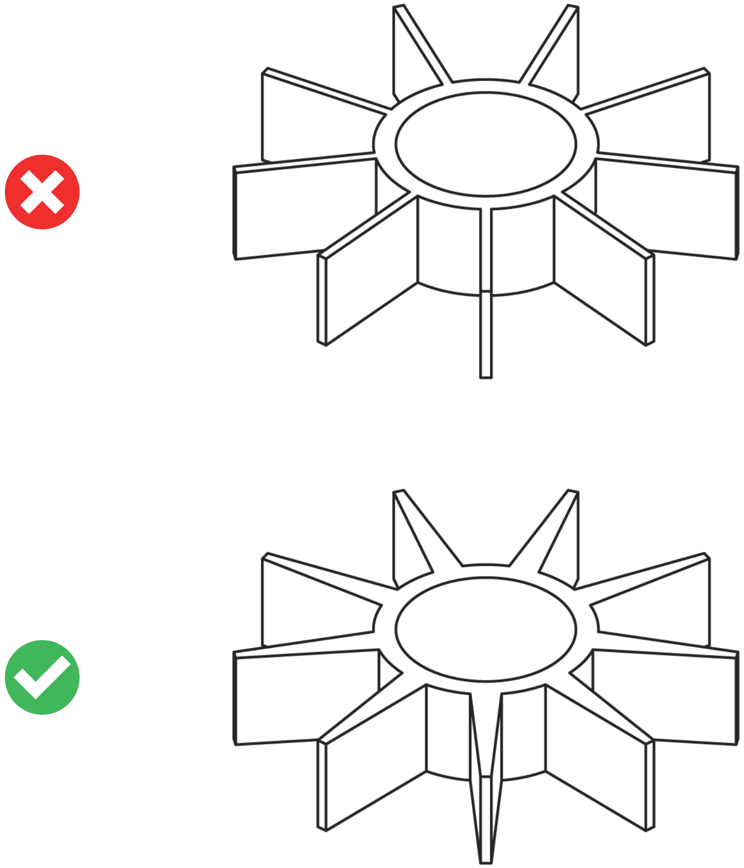
Parts can experience stress accumulation in areas associated with abrupt cross-section changes, such as thin extrusions from thick bases. Opting for gradual transitions (through fillets or chamfers) significantly reduces stress build-up in these areas.

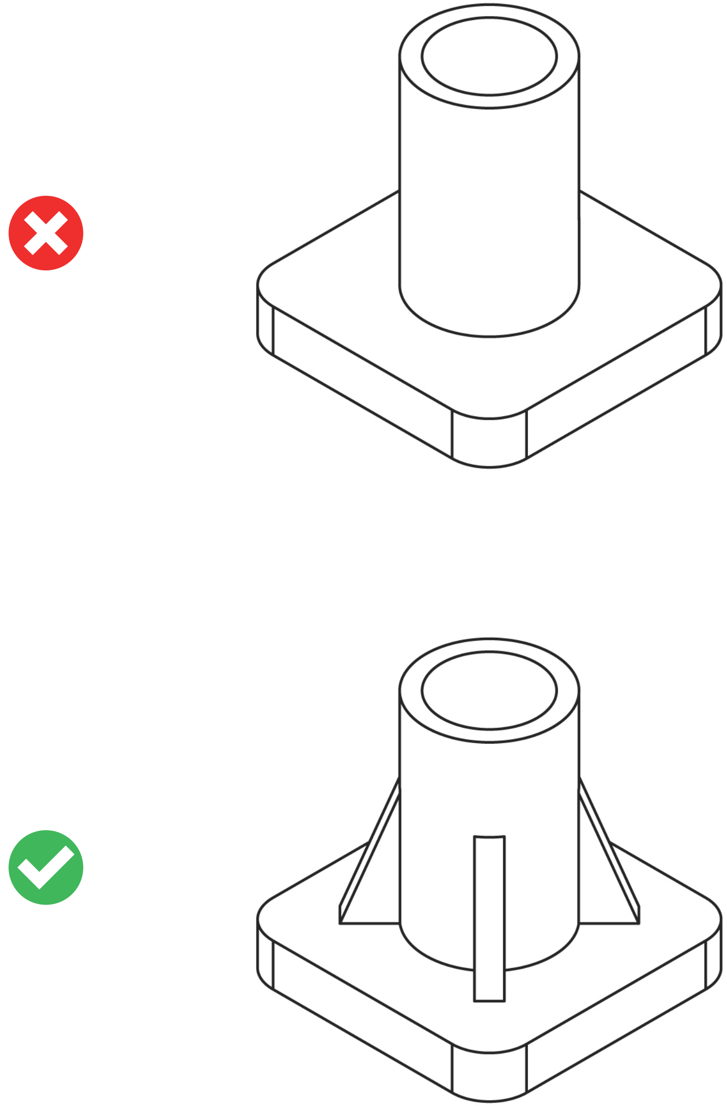




Controlling dimensional accuracy

Certain parts, due to their geometry, may be more susceptible to warping. In order to mitigate this problem, ribs and/or inclinations should be used so that the dimensional accuracy of the part is guaranteed.





SLS

Technical Data Sheets

EON PA12

This fine powder EON PA12 on the basis of polyamide 12 serves with its very well-balanced property profile a wide variety of applications. Laser-sintered parts made from EON PA12 possess excellent material properties.

Mechanical Properties (1)	Typical Value	Test Method
Izod Impact Notched	32 J/m	ISO 180/1A
Shore D Hardness	75	ISO 868
Tensile Modulus	1850 MPa	ISO 527-1/-2
Tensile Strengh	50 MPa	
Strain at break	20%	
Charpy Impact Strength	53 kJ/m²	ISO 179/1eU
Charpy Notched Impact Strength	4.8 kJ/m²	ISO 179/1eA
Flexural Modulus	1600 MPa	ISO 178
Water Absorption (Printed part)	0,70%	ISO 306
Elongation at Break (x/y)	11%	ISO 527-1
Elongation at Break (z)	6%	
Density (laser-sintered)	1.01-1.11	g/cm³

Thermal Properties	Typical Value	Test Method
Vicat Softening Temperature	175 °C	ISO 306
Heat Deflection Temperature (1.80 MPa, 260 psi)	86 °C	ISO 75-1/-2
Heat Deflection Temperature (0.45 MPa, 60 psi)	170 °C	

EON PA12-GF

EON PA12-GF powder is a polyamide with a glass-filled polymer. Parts made from this material show significantly increased durability, stiffness, as well as thermal and chemical resistance compared to EON PA12.

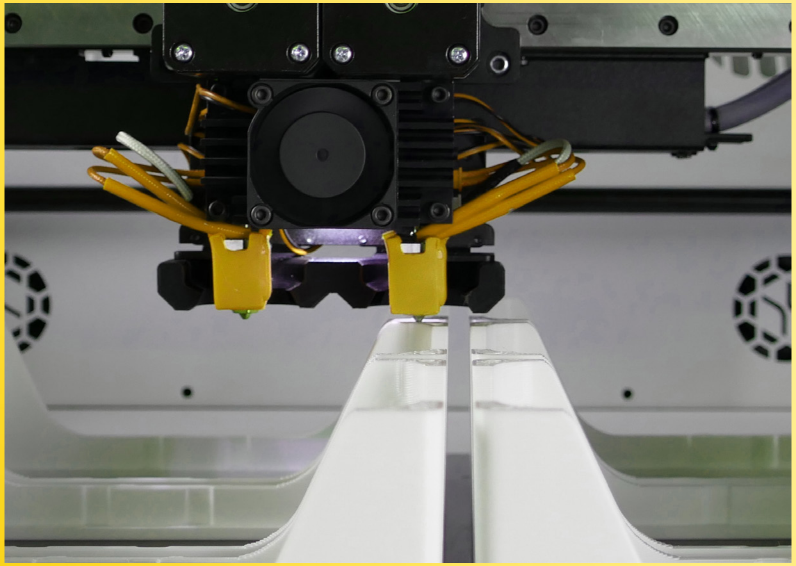
Mechanical Properties (1)	Typical Value	Test Method
Izod Impact Notched	3.6 kJ/m²	ISO 180/1A
Tensile Modulus	2800 MPa	ISO 527-1/-2
Tensile Strengh	38 MPa	
Elongation at Break (x/y)	4.0%	
Charpy Notched Impact Strength	5.4 kJ/m²	ISO 179/1eA
Flexural Strengh	56 MPa	ISO 178
Flexural Modulus	2400 MPa	
Density (laser-sintered)	1.18-1.35	g/cm³

Thermal Properties	Typical Value	Test Method
Izod Impact Notched	175 °C	ISO 306
Heat Deflection Temperature (1.80 MPa, 260 psi)	113 °C	ISO 75-1/-2
Heat Deflection Temperature (0.45 MPa, 60 psi)	170 °C	

Other Properties	Typical Value	Test Method
Water Absorption	0.24%	ASTM D570

Notes:
1) Material properties may vary with part geometry, print orientation and temperature.
2) Density of printed parts may have slight variations due to water variable absorption rates depending on location and seasonal factors.

FDM



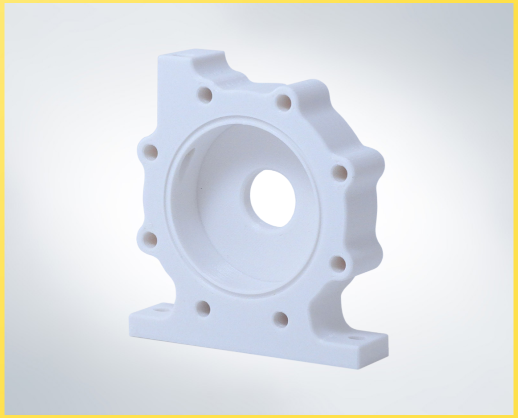
Fused Deposition Modeling

Fused Deposition Modeling (FDM) allows for the production of parts through an extrusion process in which the object is constructed by depositing molten material layer by layer.

Robotics

General tooling

And many others

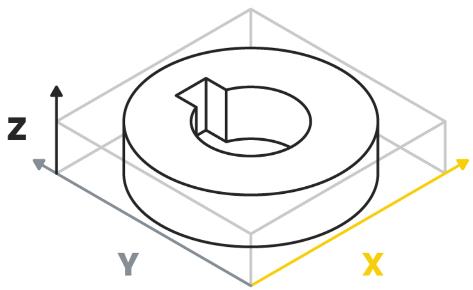


FDM

Design Guidelines

Minimum part size

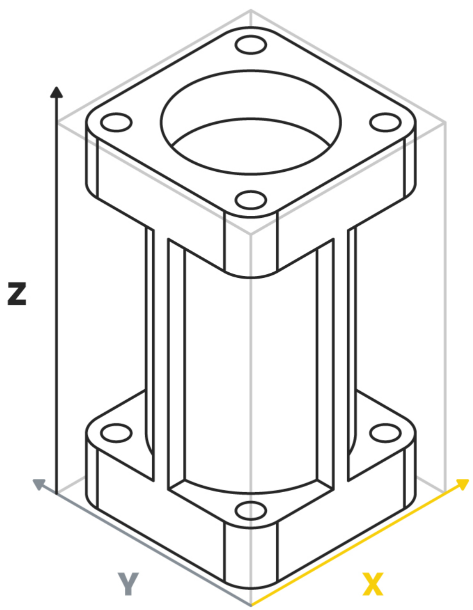
Minimum part dimensions. Even within the range shown, they must be analyzed due to possible limiting geometric details.



<table>
<tr><th></th><th>Width</th><th>Length</th><th>Height</th></tr>
<tr><td>EON ABS/ASA</td><td rowspan="6">1,6 mm</td><td rowspan="6">1,6 mm</td><td rowspan="6">0,8 mm</td></tr>
<tr><td>EON PET</td></tr>
<tr><td>EON PET ESD-SAFE</td></tr>
<tr><td>EON PC-CF</td></tr>
<tr><td>EON PLA</td></tr>
<tr><td>EON PC</td></tr>
<tr><td>EON PEKK</td><td>2,0 mm</td><td>2,0 mm</td><td>1,0 mm</td></tr>
<tr><td>EON TPU</td><td>4,0 mm</td><td>4,0 mm</td><td>1,0 mm</td></tr>
<tr><td>EON PA</td><td rowspan="2">1,6 mm</td><td rowspan="2">1,6 mm</td><td rowspan="2">0,8 mm</td></tr>
<tr><td>EON PA-CF</td></tr>
<tr><td>EON PA-CF +
Continuous Carbon Fiber</td><td>9,5 mm</td><td>9,5 mm</td><td>1,2 mm</td></tr>
<tr><td>EON PA-CF +
Continuous Kevlar Fiber</td><td rowspan="2">9,5 mm</td><td rowspan="2">9,5 mm</td><td rowspan="2">0,9 mm</td></tr>
<tr><td>EON PA-CF +
Continuous Fiberglass</td></tr>
</table>

Maximum part size

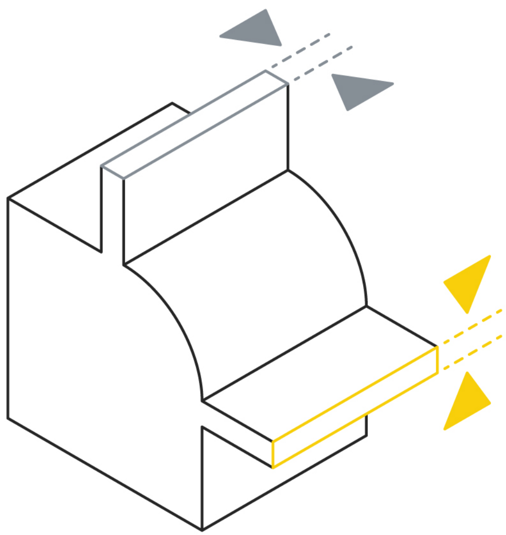
Maximum part dimensions. Even within the range shown, they must be analyzed due to possible limiting geometric details.



<table>
<tr><th></th><th>Width</th><th>Length</th><th>Height</th></tr>
<tr><td>EON ABS/ASA</td><td>250 mm</td><td>200 mm</td><td>200 mm</td></tr>
<tr><td>EON PET</td><td rowspan="4">350 mm</td><td rowspan="4">350 mm</td><td rowspan="4">350 mm</td></tr>
<tr><td>EON PET ESD-SAFE</td></tr>
<tr><td>EON PC-CF</td></tr>
<tr><td>EON PLA</td></tr>
<tr><td>EON PC</td><td>250 mm</td><td>200 mm</td><td>200 mm</td></tr>
<tr><td>EON PEKK</td><td>160 mm</td><td>160 mm</td><td>200 mm</td></tr>
<tr><td>EON TPU</td><td rowspan="6">320 mm</td><td rowspan="6">130 mm</td><td rowspan="6">150 mm</td></tr>
<tr><td>EON PA</td></tr>
<tr><td>EON PA-CF</td></tr>
<tr><td>EON PA-CF +
Continuous Carbon Fiber</td></tr>
<tr><td>EON PA-CF +
Continuous Kevlar Fiber</td></tr>
<tr><td>EON PA-CF +
Continuous Fiberglass</td></tr>
</table>

Minimum unsupported walls thickness

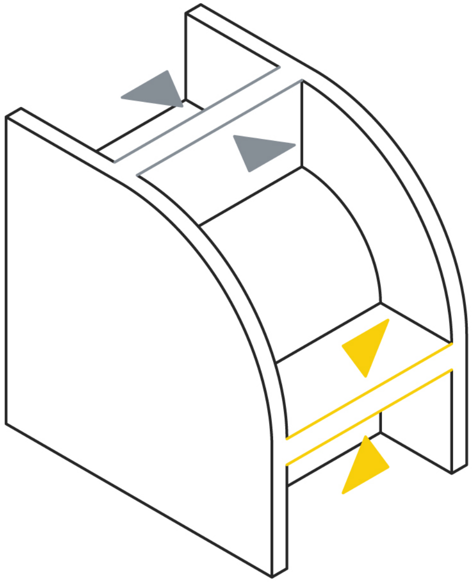
The minimum unsupported wall thickness is the minimum thickness required for a wall supported on less than two sides. Walls that are too thin may warp or separate from the model.



	Thickness
EON ABS/ASA	0,8 mm
EON PET	0,6 mm
EON PET ESD-SAFE	0,6 mm
EON PC-CF	0,5 mm
EON PLA	0,6 mm
EON PC	0,6 mm
EON PEKK	0,8 mm
EON TPU	0,7 mm
EON PA	0,6 mm
EON PA-CF	0,6 mm
EON PA-CF + Continuous Carbon Fiber	0,6 mm
EON PA-CF + Continuous Kevlar Fiber	0,6 mm
EON PA-CF + Continuous Fiberglass	0,6 mm

Minimum supported walls thickness

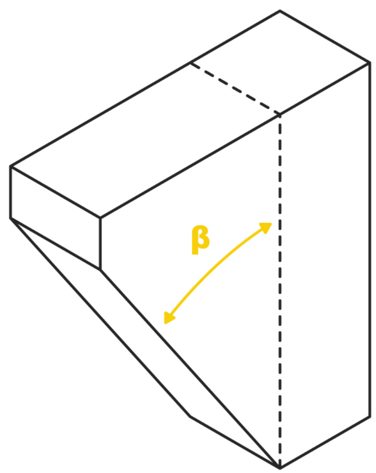
Minimum supported wall thickness is the minimum thickness required for a wall supported on two or more sides. Walls that are too thin may warp or separate from the model.



	Thickness
EON ABS/ASA	0,8 mm
EON PET	0,5 mm
EON PET ESD-SAFE	
EON PC-CF	
EON PLA	0,6 mm
EON PC	0,5 mm
EON PEKK	0,7 mm
EON TPU	
EON PA	0,5 mm
EON PA-CF	
EON PA-CF + Continuous Carbon Fiber	
EON PA-CF + Continuous Kevlar Fiber	
EON PA-CF + Continuous Fiberglass	

Maximum overhang angle without supports

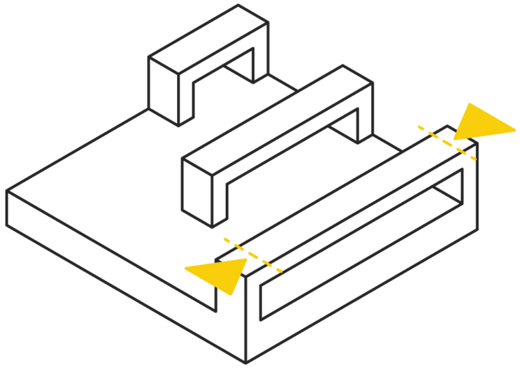
Overhangs are geometric shapes in a 3D model that extend outside the model and beyond the previous layers. These geometries have no direct support, so they can add problems when printing, but up to a certain inclination, it is possible to materialize them.



	Maximum	Recommended
EON ABS/ASA	55°	50°
EON PET	50°	45°
EON PET ESD-SAFE		
EON PC-CF	45°	40°
EON PLA	55°	50°
EON PC	50°	45°
EON PEKK	45°	40°
EON TPU	40°	35°
EON PA	45°	40°
EON PA-CF	55°	40°
EON PA-CF + Continuous Carbon Fiber		
EON PA-CF + Continuous Kevlar Fiber		
EON PA-CF + Continuous Fiberglass		

Maximum bridge without supports

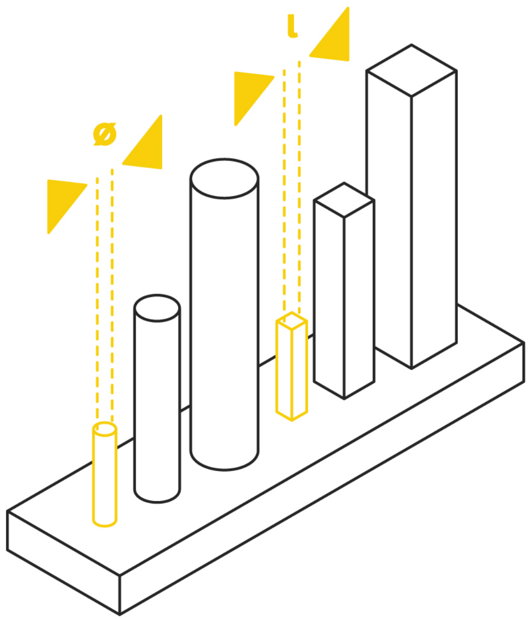
Bridges, in FDM printing processes, refer to segments where the extruder releases filament over air while moving between two supported positions on the same layer. These displacements, within a range of distances, do not compromise the print, however, beyond a certain distance, the print can have problems associated with these geometric details.



	Maximum	Recommended
EON ABS/ASA	50 mm	40 mm
EON PET	35 mm	30 mm
EON PET ESD-SAFE	40 mm	35 mm
EON PC-CF	45 mm	40 mm
EON PLA	70 mm	60 mm
EON PC	35 mm	30 mm
EON PEKK	15 mm	10 mm
EON TPU	1 mm	1 mm
EON PA		
EON PA-CF		
EON PA-CF + Continuous Carbon Fiber		
EON PA-CF + Continuous Kevlar Fiber		
EON PA-CF + Continuous Fiberglass		

Minimum Diameter/Side (Pillars)

The pillars should not be higher than five times the dimension of the pillar base. Otherwise, they will be more susceptible to cracking along the layers.

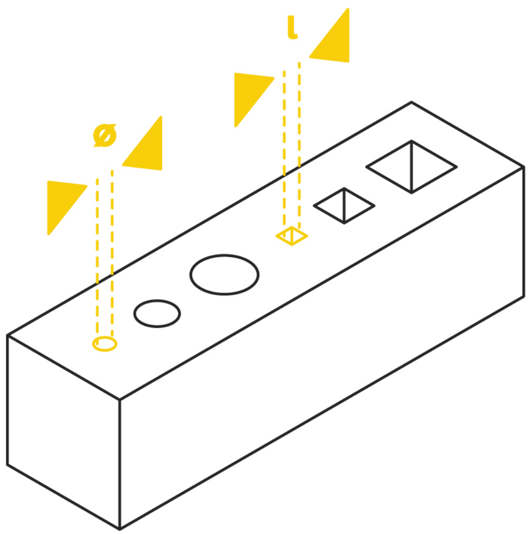


Note: In order to avoid brittle areas when post-processing the parts, at these base-pillar connection locations, add a fillet or a chamfer.

	Circular Pillars [Ø]	Square Pillars [l]
EON ABS/ASA	3 mm	3 mm
EON PET	3 mm	4 mm
EON PET ESD-SAFE		
EON PC-CF	3 mm	3 mm
EON PLA	3 mm	4 mm
EON PC	3 mm	3 mm
EON PEKK	4 mm	3 mm
EON TPU	4 mm	4 mm
EON PA	3 mm	3 mm
EON PA-CF		
EON PA-CF + Continuous Carbon Fiber		
EON PA-CF + Continuous Kevlar Fiber		
EON PA-CF + Continuous Fiberglass		

Minimum Diameter/Side (Holes)

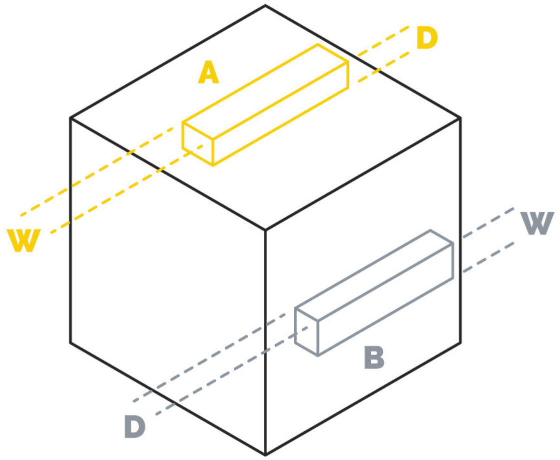
Too small diameters can cause melting of the deposited material and thus promote hole closure or a poor finish. The same can happen for square holes if their sides are too small.



	Circular Holes [Ø]	Square Holes [l]
EON ABS/ASA	2,0 mm	2,0 mm
EON PET		
EON PET ESD-SAFE		
EON PC-CF		
EON PLA		
EON PC		
EON PEKK		
EON TPU		
EON PA	1,5 mm	1,5 mm
EON PA-CF		
EON PA-CF + Continuous Carbon Fiber		
EON PA-CF + Continuous Kevlar Fiber		
EON PA-CF + Continuous Fiberglass		

Minimum embossed features

The values shown are for all materials referenced here. In cases of horizontal embosses, since the plastic extrusion alone is 0.4 mm, the width of this geometry should be dimensioned with multiples of 0.4 mm.

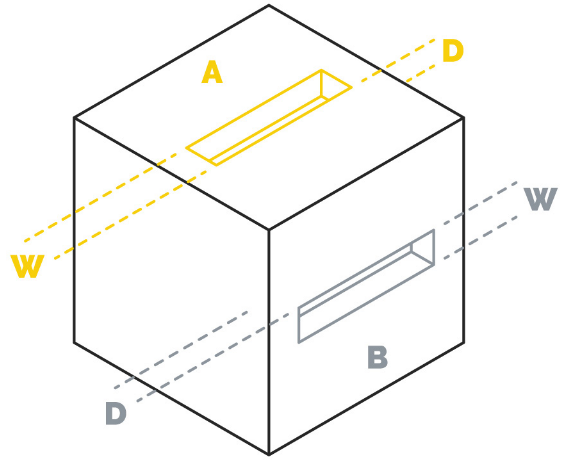


	Depth	Width
A) Horizontal Faces	0,2 mm	0,8 mm
B) Vertical Faces	0,5 mm	0,6 mm

Embossed details are extruded from the faces of the model. Embosses that are too small may become almost or completely unnoticeable. When associated with a font (text or numerical elements), use a bold font as it enhances the results.

Minimum engraved features

The values shown are for all materials referenced here. In cases of horizontal engraving, since the plastic extrusion alone is 0.4 mm, the width of the same geometry should be dimensioned with multiples of 0.4 mm.

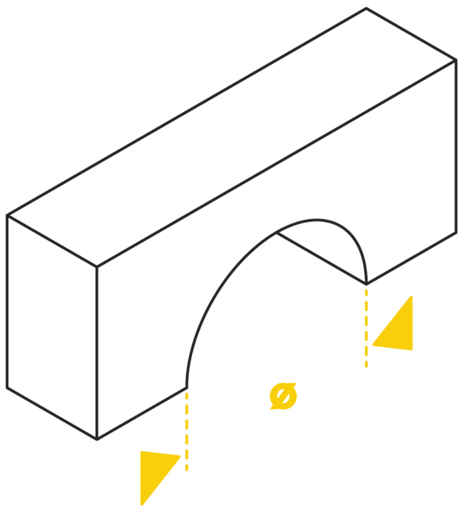


	Depth	Width
A) Horizontal Faces	0,2 mm	0,8 mm
B) Vertical Faces	0,5 mm	0,6 mm

Engraved details are cuts made from the surface of the model. Details that are too small may become almost or completely unnoticeable. When this cut is associated with a font (text or numerical elements), use a bold font as it enhances the results.

Minimum arc diameter

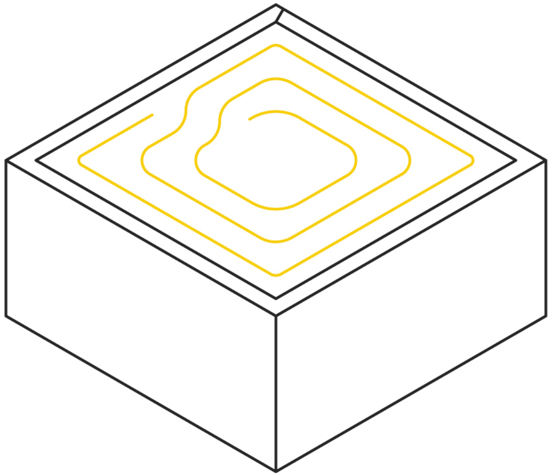
The geometry of an arc can potentialize a zone of possible overhangs depending on the diameter of the arc. Therefore, up to a certain diameter it is possible to execute an arc without running risks. However, beyond a certain diameter, unsupported structures start to enter the arc area, which can affect the print quality.

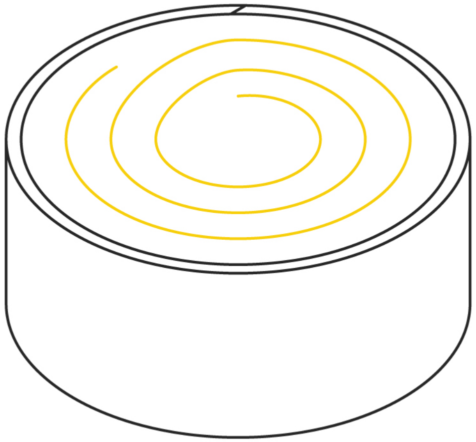


	Diameter [Ø]
EON ABS/ASA	2 mm
EON PET	
EON PET ESD-SAFE	
EON PC-CF	3 mm
EON PLA	2 mm
EON PC	3 mm
EON PEKK	
EON TPU	4 mm
EON PA	
EON PA-CF	2 mm
EON PA-CF + Continuous Carbon Fiber	
EON PA-CF + Continuous Kevlar Fiber	
EON PA-CF + Continuous Fiberglass	

Minimum area for continuous fiber reinforcement

Note that the minimum area that can be fiber-reinforced is limited to the smallest fiber strand that can be laid and cut. That said, the minimum fiber length is 45 mm.

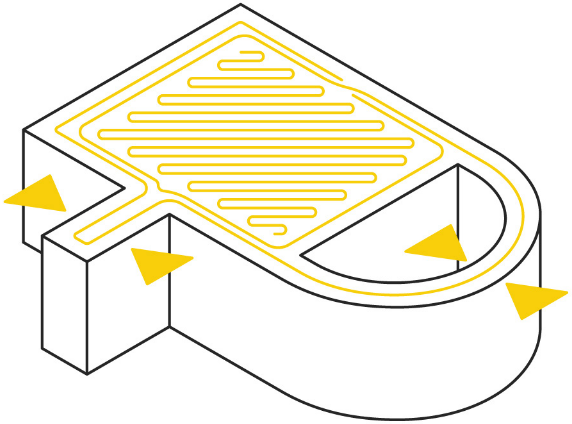




	Square Zones	Circular Zones
EON PA-CF + Continuous Carbon Fiber	90 mm^2	Ø9,6 mm
EON PA-CF + Continuous Kevlar Fiber	90 mm^2	Ø9,6 mm
EON PA-CF + Continuous Fiberglass	90 mm^2	Ø9,6 mm

Minimum width for continuous fiber reinforced zones

Depending on the geometry of the part to be reinforced, some of its zones may or may not allow the deposition of fibers. For this to be possible, some minimum dimensions must be respected.



	Rectilinear Zones	Curved Zones
EON PA-CF + Continuous Carbon Fiber	3,6 mm	2,8 mm
EON PA-CF + Continuous Kevlar Fiber		
EON PA-CF + Continuous Fiberglass		

Minimum height for continuous fiber reinforced areas

In order for a part/zone to be reinforced with continuous fiber, a minimum height must be respected so that sufficient layers are created for fiber deposition to take place.

	Height
EON PA-CF + Continuous Carbon Fiber	1,2 mm
EON PA-CF + Continuous Kevlar Fiber	0,9 mm
EON PA-CF + Continuous Fiberglass	

FDM

Technical Data Sheets

EON ABS/ASA

Given its mechanical properties, EON ABS/ASA is ideal for the production for functional prototyping, manufacturing tools, but also for the production of goods for everyday usage including outdoor applications.Its main advantages are its excellent weather resistance, good dimensional stability and low level of yellowing. This material can be used in the production of electrical and electronic equipment. It does not contain the restricted substances.Use of this material in the food or medical industry is not recommended.

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,07 g/cm³	ISO 1183	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength at Yield	40 MPa	ISO 527	-
Tensile Modulus	1,6 GPa		
Elongation at Yield Point	3,3 %		
Impact Strength Charpy	40 kJ/m²	ISO 179	Unnotched
	14 kJ/m²		Notched
Hardness	80	ISO 7619	Shore D

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	93 °C	ISO 75	0,45 MPa
	86 °C		1,8 MPa

EON PET

EON PET is a plastic with good mechanical properties and medium thermal resistance. Compared to EON PLA, it is more flexible and less brittle.These properties make it a good material for universal use, but it is specially used for mechanical components for indoor use.

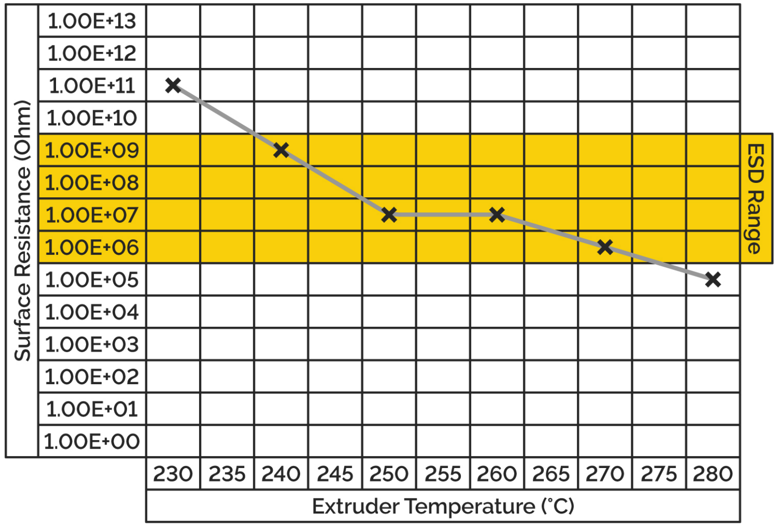
Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,27 g/cm³	ISO 1183	-
Moisture Absorption (7 Days)	0,3 %	-	Lab Test at 30 °C and 30 % RH

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength at Yield	46 MPa	ISO 527	-
Tensile Modulus	1,5 GPa		
Elongation at Yield Point	5,1 %		
Impact Strength Charpy	No Break	ISO 179	Unnotched, Z Axis
Hardness	76	ISO 7619	Shore D

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	68 °C	ISO 75	0,45 MPa

EON PET ESD-SAFE

EON PET ESD-SAFE is an advanced material designed for use in critical applications which require electrostatic discharge (ESD) protection. It is a plastic with good mechanical properties and medium thermal resistance. Compared to EON PLA, it is more flexible and less brittle. The surface resistance of the printed EON PET ESD-SAFE part will vary depending on the printer's extruder temperature. For example, if your testing indicates the part is too insulative, then increasing the extruder temperature will result in improved conductivity. Therefore, the surface resistance can be 'dialed-in' by adjusting the extruder temperature up or down depending on the reading you receive on your part.



Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,28 g/cm^3	ISO 1183	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength	50 MPa	ISO 527	-
Tensile Modulus	1800 MPa		
Tensile Elongation, Break	13 %		
Flexural Strength	74 MPa	ISO 178	
Flexural Modulus	1780 MPa		
Hardness	76	ISO 7619	Shore D

Thermal Properties	Typical Value	Test Method	Test Condition
Glass Transition Temperature (Tg)	80 °C	DSC	-
Heat Deflection Temperature	75 °C	ISO 75	0,45 MPa

Electrical Properties	Typical Value	Test Method	Test Condition
Surface Resistance	$> 10^7 - 10^9 <$ Ohm/sq	ISO 1183	-

EON PC

Polycarbonate is a polymer known for its resistance and mechanical durability, toughness and ability to withstand high temperatures. It is therefore used to produce prototypes and functional parts as well as components subject to mechanical and thermal challenges.

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,21 g/cm³	ISO 1183	-
Melt Flow Index	22 g/10 min	ISO 1183	265 °C ; 5 Kg
Moisture Absorption 7 Days (%)	0,5 %	-	Lab Test at 23 °C and 40 % RH

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength at Yield	58 MPa	ISO 527	-
Tensile Modulus	1,9 GPa	ISO 527	-
Elongation at Yield Point	5,7 %	ISO 527	-
Impact Strength Charpy	95 kJ/m²	ISO 179	Unnotched
	9 kJ/m²	ISO 179	Notched
Hardness	79	-	Shore D

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	113 °C	ISO 75	0,45 MPa
	93 °C	ISO 75	1,80 MPa

EON PC-CF

EON PC-CF has similar printing qualities to EON PC but the addition of the carbon fibers makes it even stronger, more resilient, more temperature resistant and dimensionally stable. Moreover, it also has a nice matte surface which grants a high-quality finish. Compared to other materials, EON PC-CF has good resistance to UV light and common chemicals. In summary, EON PC-CF is ideal for printing mechanical parts and heat-stressed components, for example, various gears and machine parts requiring heat resistance over 100°C.

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,16 g/cm³	ISO 1183	-
Melt Flow Index	18 g/10 min	ISO 1183	265 °C ; 5 Kg
Moisture Absorption 7 Days (%)	0,42 %	-	25 °C ; Humidity 23%

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength at Yield	55 ± 2 MPa	ISO 527	-
Tensile Modulus	2,3 ± 0,1 GPa	ISO 527	-
Elongation at Yield Point	3,5 ± 0,5 %	ISO 527	-
Flexural Strength	85 ± 1 MPa	ISO 178	-
Flexural Modulus	3,0 ± 0,1 GPa	ISO 178	-
Impact Strength Charpy	30 ± 6 kJ/m²	ISO 179	Unnotched
	9 ± 1 kJ/m²	ISO 179	Notched
Hardness	82 D	-	Shore D
Interlayer Adhesion	20 ± 2 MPa	-	-

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	114 °C	ISO 75	0,45 MPa
	106 °C	ISO 75	1,80 MPa

EON PLA

EON PLA is a plastic know for its biodegradability, as well as low thermal expansion. It is used for the fabrication of concept models, prototypes, toys, etc.

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,24 g/cm³	ISO 1183	-
Melt Flow Index	10,4 g/10 min		220 °C ; 2,16 Kg
Moisture Absorption 7 Days (%)	0,3 %	-	Lab Test at 28 °C and 37 % RH

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength at Yield	50,8 MPa	ISO 527	-
Tensile Modulus	2,2 GPa		
Elongation at Yield Point	2,9 %		
Impact Strength Charpy	12,7 kJ/m²	ISO 179	Unnotched

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	55 °C	ISO 75	0,45 MPa

EON PEKK

PolyEtherKetoneKetone, also known as EON PEKK, is one of the highest-performance polymers in the world. This polymer has outstanding mechanical, thermal, and chemical resistance properties. In addition to these properties, this material is flame resistant according to the UL 94 Standard. As a matter of fact, EON PEKK is very popular in the aerospace and automotive industries, but also in the Oil and Gas industry because of its resistance to pressure and high temperatures.

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,29 g/cm³	ISO 1183	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength at Yield	79,6 MPa	ISO 527	-
Tensile Modulus	2,6 GPa		
Elongation at Yield Point	5,9 %		
Flexural Strength	128,5 MPa	ISO 178	
Flexural Modulus	3,0 GPa		
Elongation at Máx. Flexural Stress	6,7 %		
Compression Strength	93,7 MPa	ISO 604	
Elongation	10,10 %		
Hardness	80	ISO 7619	Shore D

Thermal Properties	Typical Value	Test Method	Test Condition
Glass Transition Temperature (Tg)	165 °C	DSC	-
Melt Temperature (Tm)	335 °C		-
Deflection Temperature	182 °C	ISO 75	0,45 MPa (66psi)

EON TPU

EON TPU is an elastomer with rubber-like behavior. The thermoplastic polyurethane offers, due to its characteristics, excellent impact energy absorption properties, making it possible to manufacture flexible and unique parts that can be used in various applications, such as: joints, shock absorbers, protective coatings, and many others.

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,2 g/cm³	ISO 1183	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Modulus	98 MPa	ISO 527	At 2% Strain
	13 MPa		At 100% Strain
Tensile Stress at Break	26 MPa		-
Tensile Strain at Break	500 %		
Flexural Modulus	90 MPa	ISO 178	
Hardness	53	ISO 7619	Shore D
	95		Shore A

EON PA

EON PA is an engineering thermoplastic that is non-abrasive, ideal for non-scratching parts and great for ergonomic surfaces and workholding for pieces that are easily marred. It offers improved smoothness, great finish, strength and stiffness. EON PA exhibits outstanding abrasion resistance with good flexibility to suit a different range of applications.

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,1 g/cm³	ISO 1183	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength at Yield	51 MPa	ISO 527	-
Tensile Modulus	1,7 GPa		
Tensile Strain at Yield	4,5 %		
Tensile Stress at Break	36 MPa		
Tensile Strain at Break	150 %		
Flexural Strength	50 MPa	ISO 178	
Flexural Modulus	1,4 GPa		
IZOD Impact	110 J/m	ISO 180	Notched
Hardness	73	ISO 7619	

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	41 °C	ISO 75	0,45 MPa

EON PA-CF

EON PA-CF is a high-strength thermoplastic with excellent heat resistance, surface finish and chemical resistance. Chopped carbon fiber is what is mixed into this filament giving it high stiffness and strength. This material is 1.4 times stronger and stiffer than ABS and is perfect for anything from tooling and fixtures to end-use parts.

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,2 g/cm³	ISO 1183	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength at Yield	36 MPa	ISO 527	-
Tensile Modulus	1,4 GPa		
Tensile Strain at Yield	25 %		
Tensile Stress at Break	30 MPa		
Tensile Strain at Break	58 %		
Flexural Strength	81 MPa	ISO 178	
Flexural Modulus	3,6 GPa		
IZOD Impact	330 J/m	ISO 180	Notched
Hardness	79	ISO 7619	Shore D

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	145 °C	ISO 75	0,45 MPa

EON PA-CF + CFR

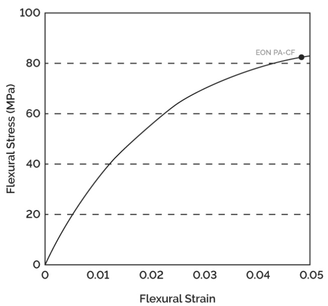
EON PA-CF is a high-strength thermoplastic with excellent heat resistance, surface finish and chemical resistance. Chopped carbon fiber is what is mixed into this filament giving it high stiffness and strength. This material is 1.4 times stronger and stiffer than ABS and is perfect for anything from tooling and fixtures to end-use parts and can be stiffened with different continuous fiber reinforcements, depending on each application. It is a versatile material both with and without reinforcing fibers.

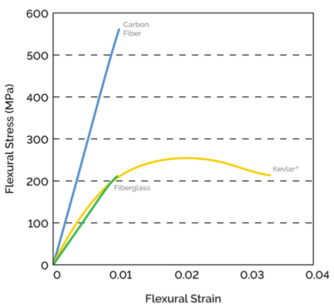
Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,2 g/cm³	ISO 1183	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Tensile Strength at Yield	36 MPa	ISO 527	-
Tensile Modulus	1,4 GPa		
Tensile Strain at Yield	25 %		
Tensile Stress at Break	30 MPa		
Tensile Strain at Break	58 %		
Flexural Strength	81 MPa	ISO 178	
Flexural Modulus	3,6 GPa		
IZOD Impact	330 J/m	ISO 180	Notched

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	145 °C	ISO 75	0,45 MPa

	Test Method	Fiber Reinforcement: Carbon	Kevlar®	Fiberglass
Tensile Strength	ISO 527	800 MPa	610 MPa	590 MPa
Tensile Modulus		60 GPa	27 GPa	21 GPa
Tensile Strain at Break		1,5 %	2,7 %	3,8 %
Flexural Strength	ISO 178	540 MPa	240 MPa	200 MPa
Flexural Modulus		51 GPa	26 GPa	22 GPa
Flexural Strain at Break		1,2 %	2,1 %	1,1 %
Compressive Strength	ASTM D 6641	320 MPa	97 MPa	140 MPa
Compressive Modulus		54 GPa	28 GPa	21 GPa
Compressive Strain at Break		0,7 %	1,5 %	-
Heat Deflection Temperature	ISO 75	105 °C	105 °C	105 °C
Izod Impact - Notched	ISO 180	960 J/m	2000 J/m	2600 J/m
Density	-	1,4 g/cm³	1,2 g/cm³	1,5 g/cm³





EON PA-CF
Flexural Strenght: 81 MPa

Kevlar ®
Flexural Strenght: 240 MPa

Carbon Fiber
Flexural Strenght: 540 MPa

Fiberglass
Flexural Strenght: 200 MPa

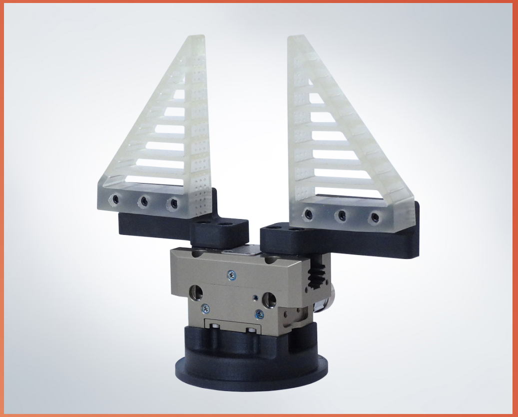
Notes:
1) Test plaques are uniquely designed to maximize test performance. Fiber test plaques are fully filled with unidirectional fiber and printed without walls. Plastic test plaques are printed with full infill.
2) All customer parts should be tested in accordance with customer's specifications.
3) Part and material performance will vary by fiber layout design, part design, specific load conditions, test conditions, build conditions and the like.
4) This representative data was tested, measured, or calculated using standard methods and are subject to change without notice.
5) The data listed here should not be used to establish design, quality control, or specification limits and are not intended to substitute for your own testing to determine suitability for each application.

SLA

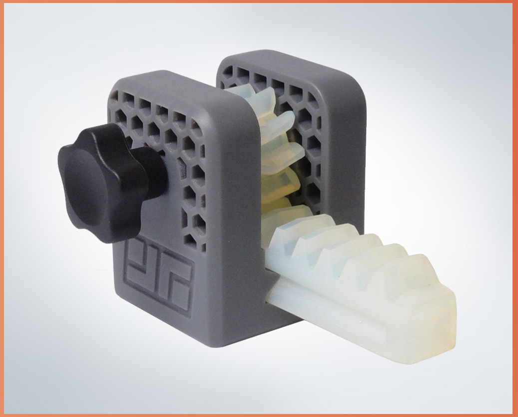
Stereolithography

SLA is a process that uses a high-precision laser to selectively cure a resin, thereby hardening and solidifying it layer by layer.

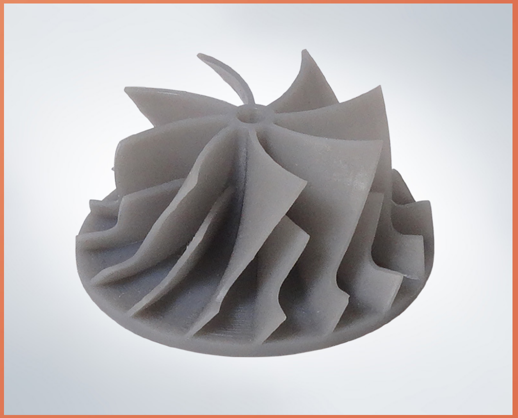
Robotics



General tooling



And many others

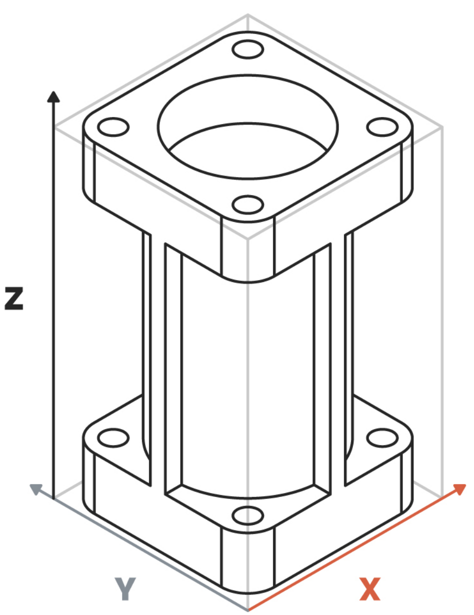


SLA

Design Guidelines

Maximum part size

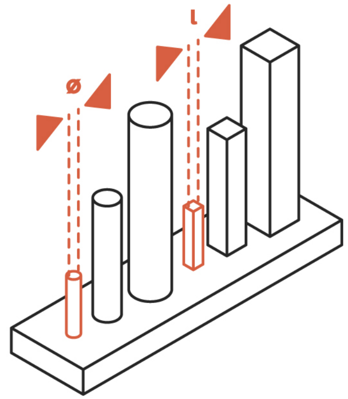
Maximum dimensions taking into account production volume. Parts, even within the range shown, must be analyzed due to possible limiting geometric details.



	Width	Length	Height
All Materials	145 mm	145 mm	185 mm

Minimum Diameter/Side (Pillars)*

The minimum pillar size is the smallest dimension that can be successfully printed.



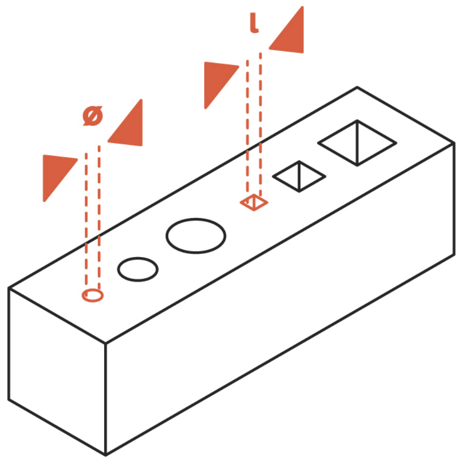
	Circular Pillars [Ø]	Square Pillars [L]
Hyperion Grey	0,5 mm	3,0 mm
Hyperion Flex 80A	0,6 mm	3,0 mm
Hyperion Flex 50A	0,8 mm	3,0 mm
Hyperion HT240	0,6 mm	2,0 mm
Hyperion Stiff 4100	0,8 mm	2,5 mm
Hyperion Resistent	0,5 mm	0,5 mm
Hyperion Dura710	0,5 mm	0,6 mm

Note: In order to avoid brittle areas when post-processing the parts, at these base-pillar connection locations, add a fillet or a chamfer.

*Please note that a pillar should not be higher than five times the dimension of the pillar base. Otherwise, they will be more susceptible to shear in layer lines.

Minimum Diameter/Side (Holes)

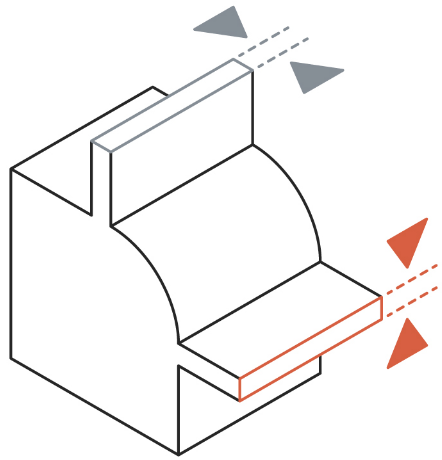
Holes that are too small can cause melting of the material in the peripheral zone and thus promote hole closure or a poor finish.



	Circular Holes [Ø]	Square Holes [l]
Hyperion Grey	2,0 mm	2,0 mm
Hyperion Flex 80A	0,8 mm	0,8 mm
Hyperion Flex 50A		
Hyperion HT240	1,0 mm	1,8 mm
Hyperion Stiff 4100	1,5 mm	1,5 mm
Hyperion Resistent	1,1 mm	1,1 mm
Hyperion Dura710	0,5 mm	0,5 mm

Minimum unsupported walls thickness

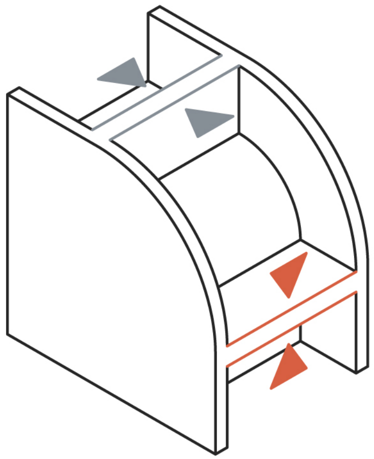
The minimum unsupported wall thickness is the minimum thickness required for a wall supported on less than two sides. Walls that are too thin may warp or separate from the model.



	Thickness
Hyperion Grey	0,6 mm
Hyperion Flex 80A	0,8 mm
Hyperion Flex 50A	
Hyperion HT240	
Hyperion Stiff 4100	0,7 mm
Hyperion Resistent	0,6 mm
Hyperion Dura710	0,5 mm

Minimum supported walls thickness

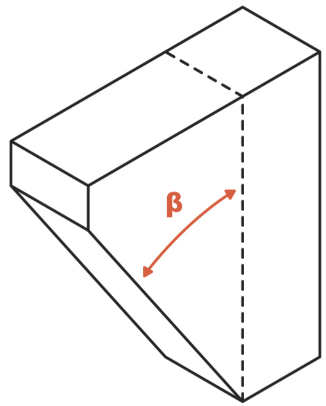
A supported wall is connected to other walls on two or more sides. A supported wall smaller than 0.4 mm may deform during the peeling process.



	Thickness
Hyperion Grey	0,4 mm
Hyperion Flex 80A	0,6 mm
Hyperion Flex 50A	
Hyperion HT240	
Hyperion Stiff 4100	0,5 mm
Hyperion Resistent	
Hyperion Dura710	0,4 mm

Maximum overhang angle without supports

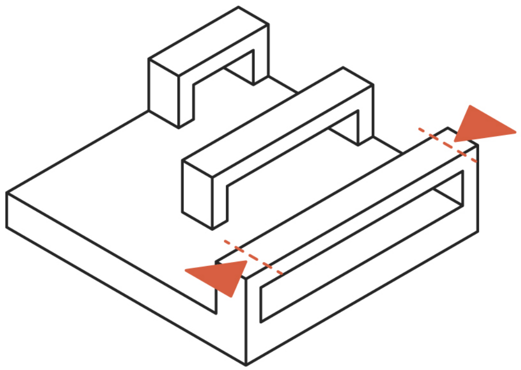
Overhangs are geometric shapes in a 3D model that extend outside the model and beyond the previous layers. These geometries have no direct support, so they can add problems when printing, but up to a certain inclination, it is possible to materialize them.



	Maximum	Recommended
Hyperion Grey	70°	55°
Hyperion Flex 80A	70°	60°
Hyperion Flex 50A	50°	45°
Hyperion HT240	55°	50°
Hyperion Stiff 4100	60°	50°
Hyperion Resistent	70°	60°
Hyperion Dura710		

Maximum bridge without supports

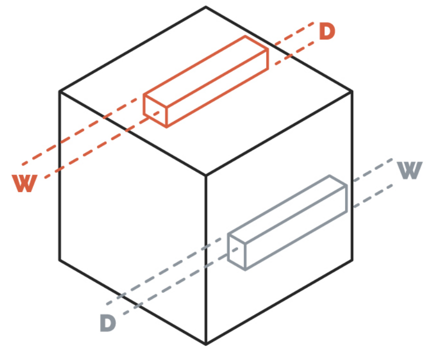
Similar to the FDM process, bridges in SLA printing refer to segments/zones of a layer whose only support is located at the edges, and therefore there is a central resin zone that will have to be sintered, with no other layer below providing support.



<table>
<tr><th></th><th>Maximum</th><th>Recommended</th></tr>
<tr><td>Hyperion Grey</td><td rowspan="2">10 mm</td><td rowspan="2">9 mm</td></tr>
<tr><td>Hyperion Flex 80A</td></tr>
<tr><td>Hyperion Flex 50A</td><td>5 mm</td><td>4 mm</td></tr>
<tr><td>Hyperion HT240</td><td>15 mm</td><td>12 mm</td></tr>
<tr><td>Hyperion Stiff 4100</td><td>18 mm</td><td>18 mm</td></tr>
<tr><td>Hyperion Resistent</td><td rowspan="2">22 mm</td><td rowspan="2">22 mm</td></tr>
<tr><td>Hyperion Dura710</td></tr>
</table>

Minimum embossed features

Embossed details are extruded from the faces of the model. Too small embosses can become almost or completely unnoticeable. When this feature is associated with a font (text or numerical elements), use a bold font as it enhances the results.

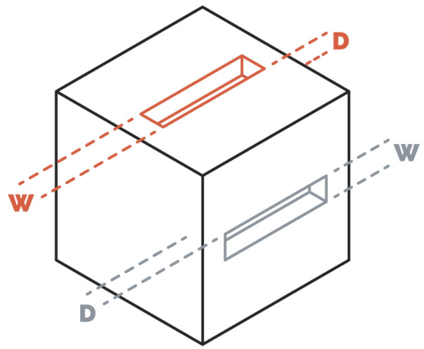


<table>
<tr><th></th><th>Depth</th><th>Width</th></tr>
<tr><td>Hyperion Grey</td><td>0,2 mm</td><td>3,0 mm</td></tr>
<tr><td>Hyperion Flex 80A</td><td rowspan="2">0,1 mm</td><td rowspan="2">0,1 mm</td></tr>
<tr><td>Hyperion Flex 50A</td></tr>
<tr><td>Hyperion HT240</td><td rowspan="3">0,2 mm</td><td rowspan="3">0,5 mm</td></tr>
<tr><td>Hyperion Stiff 4100</td></tr>
<tr><td>Hyperion Resistent</td></tr>
<tr><td>Hyperion Dura710</td><td>0,1 mm</td><td>0,6 mm</td></tr>
</table>

Note: The values shown in this table provide depth and witdh measures for both horizontal and vertical faces.

Minimum engraved features

Engraved details are cuts made from the surface of the model. Details that are too small can become almost or completely unnoticeable. When this cut is associated with a font (text or numerical elements), use a bold font as it enhances the results.



<table>
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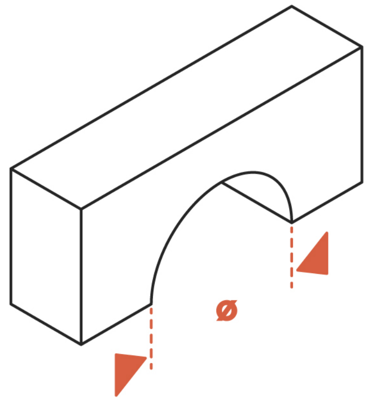
<tr><td>Hyperion Flex 80A</td></tr>
<tr><td>Hyperion Flex 50A</td></tr>
<tr><td>Hyperion HT240</td><td rowspan="2">0,4 mm</td><td rowspan="2">0,5 mm</td></tr>
<tr><td>Hyperion Stiff 4100</td></tr>
<tr><td>Hyperion Resistent</td><td>0,5 mm</td><td>0,5 mm</td></tr>
<tr><td>Hyperion Dura710</td><td>0,4 mm</td><td>0,4 mm</td></tr>
</table>

Note: The values shown in this table provide depth and witdh measures for both horizontal and vertical faces.

Minimum arc diameter

The geometry of an arc can potentialize a zone of possible overhangs depending on the diameter of the arc. Therefore, up to a certain diameter it is possible to execute an arc without running risks. However, beyond a certain diameter, unsupported structures start to enter the arc area, which can affect the print quality.



<table>
<tr><th></th><th>Diameter [Ø]</th></tr>
<tr><td>Hyperion Grey</td><td>1,7 mm</td></tr>
<tr><td>Hyperion Flex 80A</td><td rowspan="2">1,4 mm</td></tr>
<tr><td>Hyperion Flex 50A</td></tr>
<tr><td>Hyperion HT240</td><td rowspan="2">1,3 mm</td></tr>
<tr><td>Hyperion Stiff 4100</td></tr>
<tr><td>Hyperion Resistent</td><td>1,2 mm</td></tr>
<tr><td>Hyperion Dura710</td><td>1,8 mm</td></tr>
</table>

SLA

Technical Data Sheets

Hyperion Grey

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,08 g/cm³	-	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Ultimate Tensile Strength	65 MPa	ASTM D 638-10	-
Tensile Modulus	2,80 GPa	ASTM D 638-10	-
Elongation at Break	6,2 %	ASTM D 638-10	-
Flexural Modulus	2,20 GPa	ASTM C 790-10	-
Notched IZOD	25 J/m	ASTM D 256-10	-

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	58,4 °C	ASTM D 648-07	1,80 MPa
	73,1 °C		0,45 MPa

Solvent	24 Hour Weight Gain	Solvent	24 Hour Weight Gain
Acetic Acid 5%	< 1 %	Hydrogen Peroxide (3 %)	< 1 %
Acetone	Sample Cracked	Isooctane	< 1 %
Isopropyl Alcohol	< 1 %	Mineral Oil, Light	< 1 %
Bleach, ~5 % NaOCl	< 1 %	Mineral Oil, Heavy	< 1 %
Butyl Acetate	< 1 %	Salt Water (3,5 % NaCl)	< 1 %
Diesel	< 1 %	Sodium Hydroxide (0,025 % pH = 10)	< 1 %
Diethyl Glycol Monomethyl Ether	1,70 %	Water	< 1 %
Hydrolic Oil	< 1 %	Xylene	< 1 %
Skydrol 5	1 %	Strong Acid (HCl Conc)	Distorted

Solvent Compatibility: Percent weight gain over 24 hours for a printed and post-cured 1 x 1 x 1 cm cube immersed in respective solvent:

Notes:
1) Tests plaques are designed to maximize test performance. Test plaques are printed with full infill. All customer parts should be tested in accordance with customer's specifications. Material properties can vary with part geometry, print orientation, print settings and temperature.
2) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C.
3) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C plus an additional thermal cure in a lab oven for 180 minutes at 160 °C.

Hyperion Flex 80A

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,06 g/cm³	-	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Ultimate Tensile Strength	8,9 MPa	ASTM D 412-06 (A)	-
Stress at 50 % Elongation	3,1 MPa		
Stress at 100 % Elongation	6,3 MPa		
Elongation at Break	120 %		
Shore Hardness	80A	ASTM 2240	
Compression Set (23 °C for 22 hours)	3 %	ASTM D 624-00	
Compression Set (70 °C for 22 hours)	5 %	ASTM D 395-03 (B)	
Tear Strength	24 kN/m		
Ross Flex Fatigue at 23 °C	> 200,000 cycles	ASTM D 1052	Notched ; 60° Bending ; 100 cycles/min
Ross Flex Fatigue at -10 °C	> 50,000 cycles		
Bayshore Resilience	28 %	ASTM D 2632	-

Thermal Properties	Typical Value	Test Method	Test Condition
Glass Transition Temperature (Tg)	27 °C	DMA	-

Solvent	24 Hour Weight Gain	Solvent	24 Hour Weight Gain
Acetic Acid 5%	0,9 %	Hydrogen Peroxide (3 %)	0,7 %
Acetone	37,4 %	Isooctane	1,6 %
Isopropyl Alcohol	11,7 %	Mineral Oil, Light	0,1 %
Bleach, ~5 % NaOCl	0,6 %	Mineral Oil, Heavy	< 0,1 %
Butyl Acetate	51,4 %	Salt Water (3,5 % NaCl)	0,5 %
Diesel	2,3 %	Sodium Hydroxide (0,025 % pH = 10)	0,6 %
Diethyl Glycol Monomethyl Ether	19,3 %	Water	0,7 %
Hydrolic Oil	1,0 %	Xylene	64,1 %
Skydrol 5	10,7 %	Strong Acid (HCl Conc)	28,6 %
Tripropylene Glycol Methyl Ether	13,6 %	-	-

Solvent Compatibility: Percent weight gain over 24 hours for a printed and post-cured 1 x 1 x 1 cm cube immersed in respective solvent:

Notes:

1) Tests plaques are designed to maximize test performance. Test plaques are printed with full infill. All customer parts should be tested in accordance with customer's specifications. Material properties can vary with part geometry, print orientation, print settings and temperature.

2) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C.

3) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C plus an additional thermal cure in a lab oven for 180 minutes at 160 °C.

Hyperion Flex 50A

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,02 g/cm³	-	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Ultimate Tensile Strength	3,23 MPa	ASTM D 412-06 (A)	-
Stress at 50 % Elongation	0,94 MPa	ASTM D 412-06 (A)	-
Stress at 100 % Elongation	1,59 MPa	ASTM D 412-06 (A)	-
Elongation at Break	160 %	ASTM D 412-06 (A)	-
Shore Hardness	50A	ASTM 2240	-
Compression Set (23 °C for 22 hours)	2 %	ASTM D 395-03 (B)	-
Compression Set (70 °C for 22 hours)	9 %	ASTM D 395-03 (B)	-
Tear Strength	19,1 kN/m	ASTM D 624-00	-

Solvent	24 Hour Weight Gain	Solvent	24 Hour Weight Gain
Acetic Acid 5%	2,8 %	Hydrogen Peroxide (3 %)	2,2 %
Acetone	37,3 %	Isooctane	3,5 %
Isopropyl Alcohol	25,6 %	Mineral Oil, Light	< 1 %
Bleach, ~5 % NaOCl	2 %	Mineral Oil, Heavy	< 1 %
Butyl Acetate	39,6 %	Salt Water (3,5 % NaCl)	1,7 %
Diesel	4,2 %	Sodium Hydroxide (0,025 % pH = 10)	2 %
Diethyl Glycol Monomethyl Ether	28,6 %	Water	2,3 %
Hydrolic Oil	2,1 %	Xylene	46,6 %
Skydrol 5	21,7 %	Strong Acid (HCl Conc)	39,4 %

Solvent Compatibility: Percent weight gain over 24 hours for a printed and post-cured 1 x 1 x 1 cm cube immersed in respective solvent:

Notes:

1) Tests plaques are designed to maximize test performance. Test plaques are printed with full infill. All customer parts should be tested in accordance with customer's specifications. Material properties can vary with part geometry, print orientation, print settings and temperature.

2) Data was obtained from parts printed using SLA Machine, 100 μm and post-cured with a Curing Machine for 120 minutes at 80 °C.

3) Data was obtained from parts printed using SLA Machine, 100 μm and post-cured with a Curing Machine for 120 minutes at 80 °C plus an additional thermal cure in a lab oven for 180 minutes at 160 °C.

Hyperion HT240

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,14 g/cm³	-	-

Mechanical Properties (1)	Typical Value: Post-Cured (2)	Typical Value: Post-Cured + Thermally Post-Cured (3)	Test Method	Test Condition
Ultimate Tensile Strength	58,3 MPa	51,1 MPa	ASTM D 638-14	-
Tensile Modulus	2,75 GPa	2,9 GPa	ASTM D 638-14	-
Elongation at Break	3,3 %	2,4 %	ASTM D 638-14	-
Flexural Strength at Break	94,5 MPa	93,8 MPa	ASTM D 790-15	-
Flexural Strength	2,62 GPa	2,62 GPa	ASTM D 256-10	-
Notched IZOD	18,2 J/m	24,2 J/m	ASTM D 256-10	-

Thermal Properties	Typical Value: Post-Cured (2)	Typical Value: Post-Cured + Thermally Post-Cured (3)	Test Method	Test Condition
Heat Deflection Temperature	99,2 °C	101 °C	ASTM D 648-16	1,80 MPa
	142 °C	238 °C	ASTM D 648-16	0,45 MPa
Thermal Expansion	79,6 μm/m/°C	74 μm/m/°C	ASTM E 831-13	-

Solvent	24 Hour Weight Gain	Solvent	24 Hour Weight Gain
Acetic Acid 5%	< 1 %	Hydrogen Peroxide (3 %)	< 1 %
Acetone	< 1 %	Isooctane	< 1 %
Isopropyl Alcohol	< 1 %	Mineral Oil, Light	< 1 %
Bleach, ~5 % NaOCl	< 1 %	Mineral Oil, Heavy	< 1 %
Butyl Acetate	< 1 %	Salt Water (3,5 % NaCl)	< 1 %
Diesel	< 1 %	Sodium Hydroxide (0,025 % pH = 10)	< 1 %
Diethyl Glycol Monomethyl Ether	< 1 %	Water	< 1 %
Hydrolic Oil	< 1 %	Xylene	< 1 %
Skydrol 5	< 1 %	Strong Acid (HCl Conc)	1,2 %

Solvent Compatibility: Percent weight gain over 24 hours for a printed and post-cured 1 x 1 x 1 cm cube immersed in respective solvent:

Notes:
1) Tests plaques are designed to maximize test performance. Test plaques are printed with full infill. All customer parts should be tested in accordance with customer's specifications. Material properties can vary with part geometry, print orientation, print settings and temperature.
2) Data was obtained from parts printed using SLA Machine, 100 μm and post-cured with a Curing Machine for 120 minutes at 80 °C.
3) Data was obtained from parts printed using SLA Machine, 100 μm and post-cured with a Curing Machine for 120 minutes at 80 °C plus an additional thermal cure in a lab oven for 180 minutes at 160 °C.

Hyperion Stiff 4100

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,26 g/cm³	-	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Ultimate Tensile Strength	69 MPa	ASTM D 638-14	-
Tensile Modulus	4,10 GPa		
Elongation at Break	5,3 %		
Flexural Strength	105 MPa	ASTM D 790-15	
Flexural Modulus	3,40 GPa		
Notched IZOD	23 J/m	ASTM D 256-10	

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	60 °C	ASTM D 648-16	1,80 MPa
	77 °C		0,45 MPa
Thermal Expansion	63 µm/m/°C	ASTM E 831-13	-

Solvent	24 Hour Weight Gain	Solvent	24 Hour Weight Gain
Acetic Acid 5%	0,8 %	Hydrogen Peroxide (3 %)	0,87 %
Acetone	3,3 %	Isooctane	< 0,1 %
Isopropyl Alcohol	0,38 %	Mineral Oil, Light	0,22 %
Bleach, ~5 % NaOCl	0,69 %	Mineral Oil, Heavy	0,15 %
Butyl Acetate	< 0,1 %	Salt Water (3,5 % NaCl)	0,71 %
Diesel		Sodium Hydroxide (0,025 % pH = 10)	0,68 %
Diethyl Glycol Monomethyl Ether	1,4 %	Water	0,70 %
Hydrolic Oil	0,17 %	Xylene	< 0,1 %
Skydrol 5	1,1 %	Strong Acid (HCl Conc)	5,3 %

Solvent Compatibility: Percent weight gain over 24 hours for a printed and post-cured 1 x 1 x 1 cm cube immersed in respective solvent:

Notes:
1) Tests plaques are designed to maximize test performance. Test plaques are printed with full infill. All customer parts should be tested in accordance with customer's specifications. Material properties can vary with part geometry, print orientation, print settings and temperature.
2) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C.
3) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C plus an additional thermal cure in a lab oven for 180 minutes at 160 °C.

Hyperion Resistent

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,07 g/cm³	-	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Ultimate Tensile Strength	33 MPa	ASTM D 638-14	-
Tensile Modulus	1,50 GPa	ASTM D 638-14	-
Elongation at Break	51 %	ASTM D 638-14	-
Flexural Strength	39 MPa	ASTM D 790-15	-
Flexural Modulus	1,40 GPa	ASTM D 790-15	-
Notched IZOD	67 J/m	ASTM D 256-10	-
Unnotched IZOD	1387 J/m	ASTM D 4812-11	-

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	45 °C	ASTM D 648-16	1,80 MPa
	52 °C		0,45 MPa
Thermal Expansion	97 µm/m/°C	ASTM E 831-13	-

Solvent	24 Hour Weight Gain	Solvent	24 Hour Weight Gain
Acetic Acid 5%	0,75 %	Hydrogen Peroxide (3 %)	0,71 %
Acetone	19,07 %	Isooctane	0,02 %
Isopropyl Alcohol	3,15 %	Mineral Oil, Light	0,05 %
Bleach, ~5 % NaOCl	0,62 %	Mineral Oil, Heavy	0,09 %
Butyl Acetate	5,05 %	Salt Water (3,5 % NaCl)	0,66 %
Diesel	0,11 %	Sodium Hydroxide (0,025 % pH = 10)	0,70 %
Diethyl Glycol Monomethyl Ether	5,25 %	Water	0,69 %
Hydrolic Oil	0,17 %	Xylene	3,22 %
Skydrol 5	0,46 %	Strong Acid (HCl Conc)	4,39 %

Solvent Compatibility: Percent weight gain over 24 hours for a printed and post-cured 1 x 1 x 1 cm cube immersed in respective solvent:

Notes:
1) Tests plaques are designed to maximize test performance. Test plaques are printed with full infill. All customer parts should be tested in accordance with customer's specifications. Material properties can vary with part geometry, print orientation, print settings and temperature.
2) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C.
3) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C plus an additional thermal cure in a lab oven for 180 minutes at 160 °C.

Hyperion Dura 710

Physical Properties	Typical Value	Test Method	Test Condition
Material Density	1,07 g/cm³	-	-

Mechanical Properties (1)	Typical Value	Test Method	Test Condition
Ultimate Tensile Strength	28 MPa	ASTM D 638-14	-
Tensile Modulus	1,0 GPa		
Elongation at Break	55 %		
Flexural Strength	24 MPa	ASTM D 790-17	
Flexural Modulus	0,66 GPa		
Notched IZOD	114 J/m	ASTM D 256-10 (2018)	
Unnotched IZOD	710 J/m	ASTM D 4812-11	
Hardness	73	ISO 7619	Shore D

Thermal Properties	Typical Value	Test Method	Test Condition
Heat Deflection Temperature	41 °C	ASTM D 648-18	Method B at 0,45 MPa
Thermal Expansion	106 µm/m/°C	ASTM E 831-14	-

Solvent	24 Hour Weight Gain	Solvent	24 Hour Weight Gain
Acetic Acid 5%	1,3 %	Hydrogen Peroxide (3 %)	1 %
Acetone	Sample Cracked	Isooctane	< 1 %
Isopropyl Alcohol	5,1 %	Mineral Oil, Light	
Bleach, ~5 % NaOCl	< 1 %	Mineral Oil, Heavy	
Butyl Acetate	7,9 %	Salt Water (3,5 % NaCl)	
Diesel	< 1 %	Sodium Hydroxide (0,025 % pH = 10)	
Diethyl Glycol Monomethyl Ether	7,8 %	Water	
Hydrolic Oil	< 1 %	Xylene	6,5 %
Skydrol 5	1,3 %	Strong Acid (HCl Conc)	Distorted

Solvent Compatibility: Percent weight gain over 24 hours for a printed and post-cured 1 x 1 x 1 cm cube immersed in respective solvent:

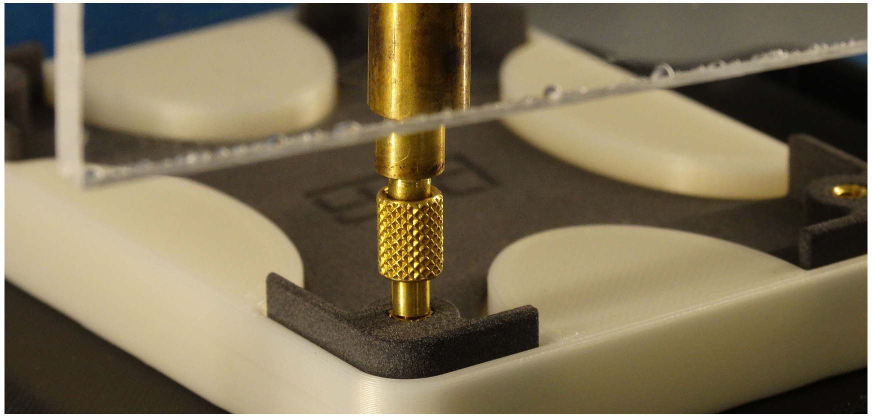
Notes:
1) Tests plaques are designed to maximize test performance. Test plaques are printed with full infill. All customer parts should be tested in accordance with customer's specifications. Material properties can vary with part geometry, print orientation, print settings and temperature.
2) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C.
3) Data was obtained from parts printed using SLA Machine, 100 µm and post-cured with a Curing Machine for 120 minutes at 80 °C plus an additional thermal cure in a lab oven for 180 minutes at 160 °C.

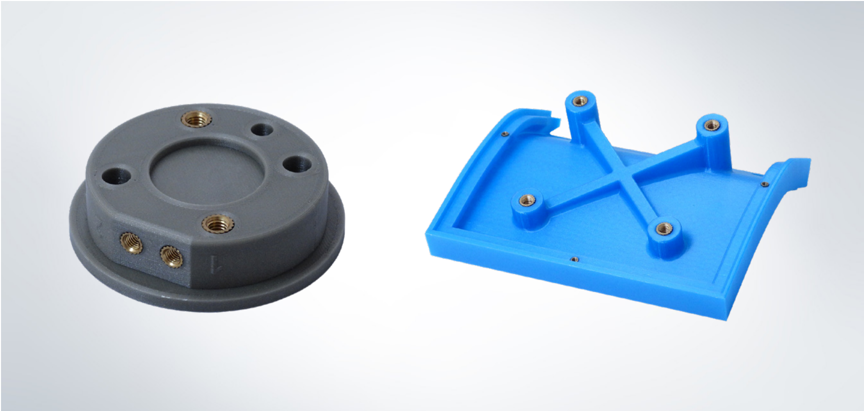
Finishing

Threaded Inserts

Heat staking

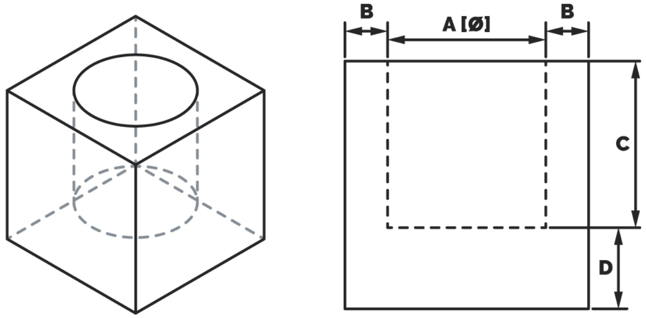
Heat Staking is a process that uses heat to join threaded inserts to already printed parts that need to have a threaded connection. This is a fast process and ensures that there is a consistent thread on the part, thus allowing the part to have a longer life span. To perform this process, the insert is preheated through induction and then pressed against the location where it will be housed.





Geometric Considerations

In order for the insert to be properly placed, some geometric rules that ensure correct coupling must be respected. These standards can be seen in the following table:



	A [Ø]	B	C	D
M2×4,0	3,2 mm	1,3 mm	4,0 mm	1,0 mm
M2×2,5	3,0 mm	1,3 mm	2,7 mm	1,0 mm
M3×5,8	4,1 mm	1,6 mm	5,8 mm	1,0 mm
M3×4,0	4,1 mm	2,3 mm	5,0 mm	1,0 mm
M4×8,2	5,7 mm	2,1 mm	8,2 mm	1,0 mm
M5×9,6	6,5 mm	2,6 mm	9,6 mm	1,0 mm
M6×12,8	8,1 mm	3,3 mm	12,8 mm	1,0 mm
M8×12,9	9,7 mm	4,5 mm	12,8 mm	1,0 mm
M10×13,7	11,7 mm	4 mm	13,7 mm	1,0 mm

Finishing

Surface Treatment

Polishing

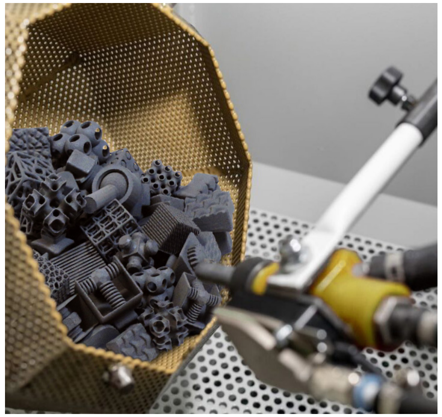
Machining process applied through vibratory finishing equipment. Proprietary recipes of media, paste and liquid are applied to achieve a delicate high-quality finish on AM parts.

Before

After

Blasting

Mechanical surface treatment of parts by the action of abrasives. In-house developed recipes of media allow an effective smoothing or cleaning of AM parts.



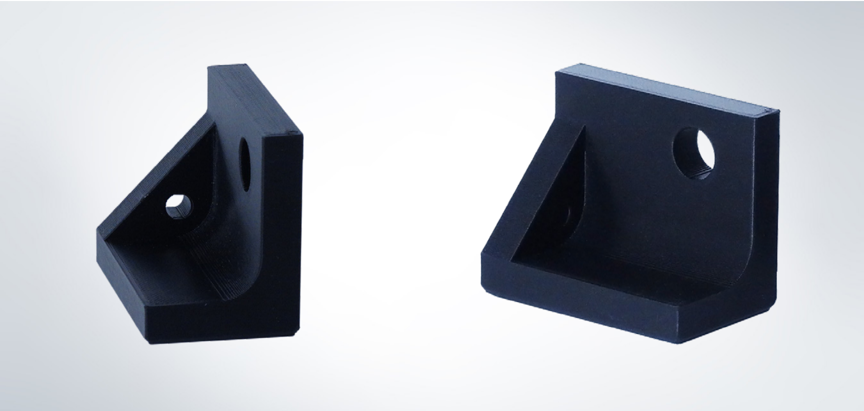
Before

After

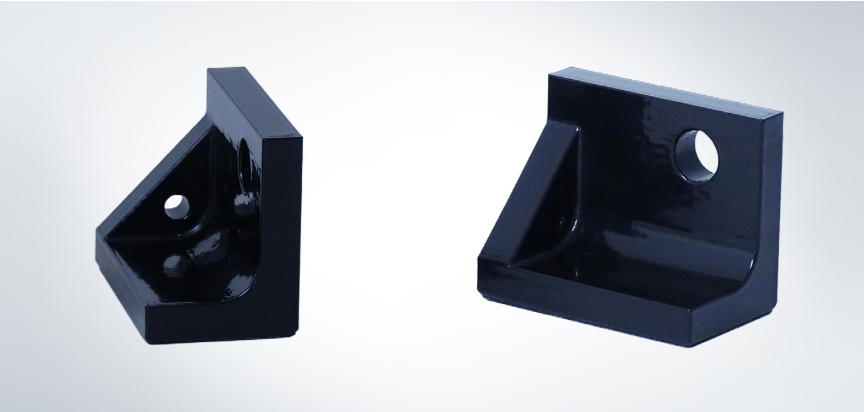
Vapor Smoothing

Surface treatment process that requires the management of temperature, pressure and specific solvents. Evenly smooths all kinds of surfaces on AM parts.

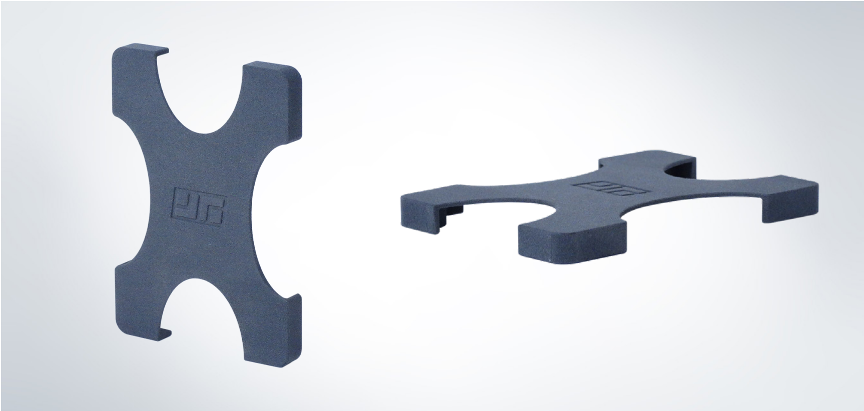
Available for: **EON ABS/ASA**, **EON PA12**.



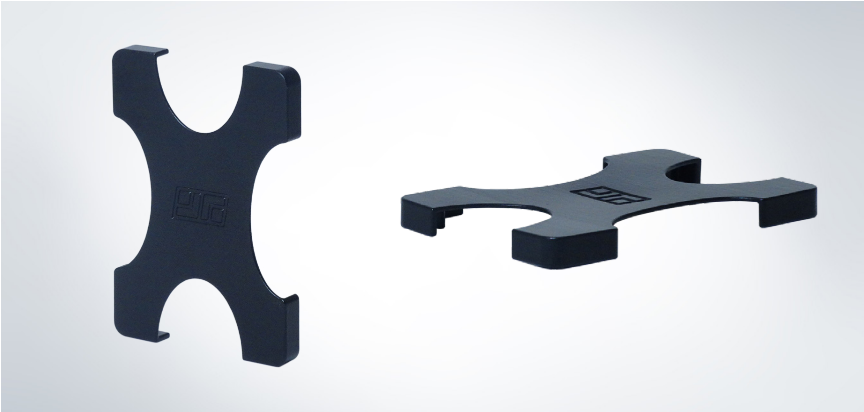
Before



After



Before



After

Finishing

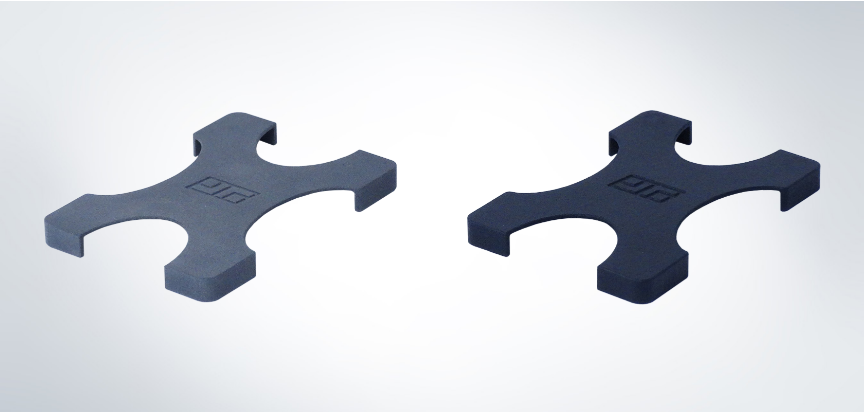
Coating

Dyeing

Coloring process through the penetration of dye in the parts that allows to long-lasting, UV-stable coloring.

Available colors: **Black**
Available for: **EON PA12**, **EON PA12GF**

Before After



Before After

Spray Painting

Coating that allows to achieve high-quality results, offering multiple surface finish options like matte, semi-gloss or glossy.

Available colors*: ● **RAL9005**, ● **RAL3000**, ● **RAL9003**, ● **RAL6018**, ● **RAL5005**
Available for: **All, except flexible or rubber-like materials**.

*Other colors on request.

Finishing

Special Applications

Laser Engraving

Manufacturing process for marking of objects using a laser.

Sterilization

Steam sterilization in autoclave for thermoresistant devices. Sterilization cycle according to ISO 17665 overkill approach, Minimum 134°C for 5'. EtO sterilization in chemical chamber for thermoresistant and thermosensitive devices. Sterilization cycle according to ISO 11135, 21kg +/- 2 kg EtO, 4h exposure (final product whitin residual EtO <2ppm).

RMN® ADDITIVE

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