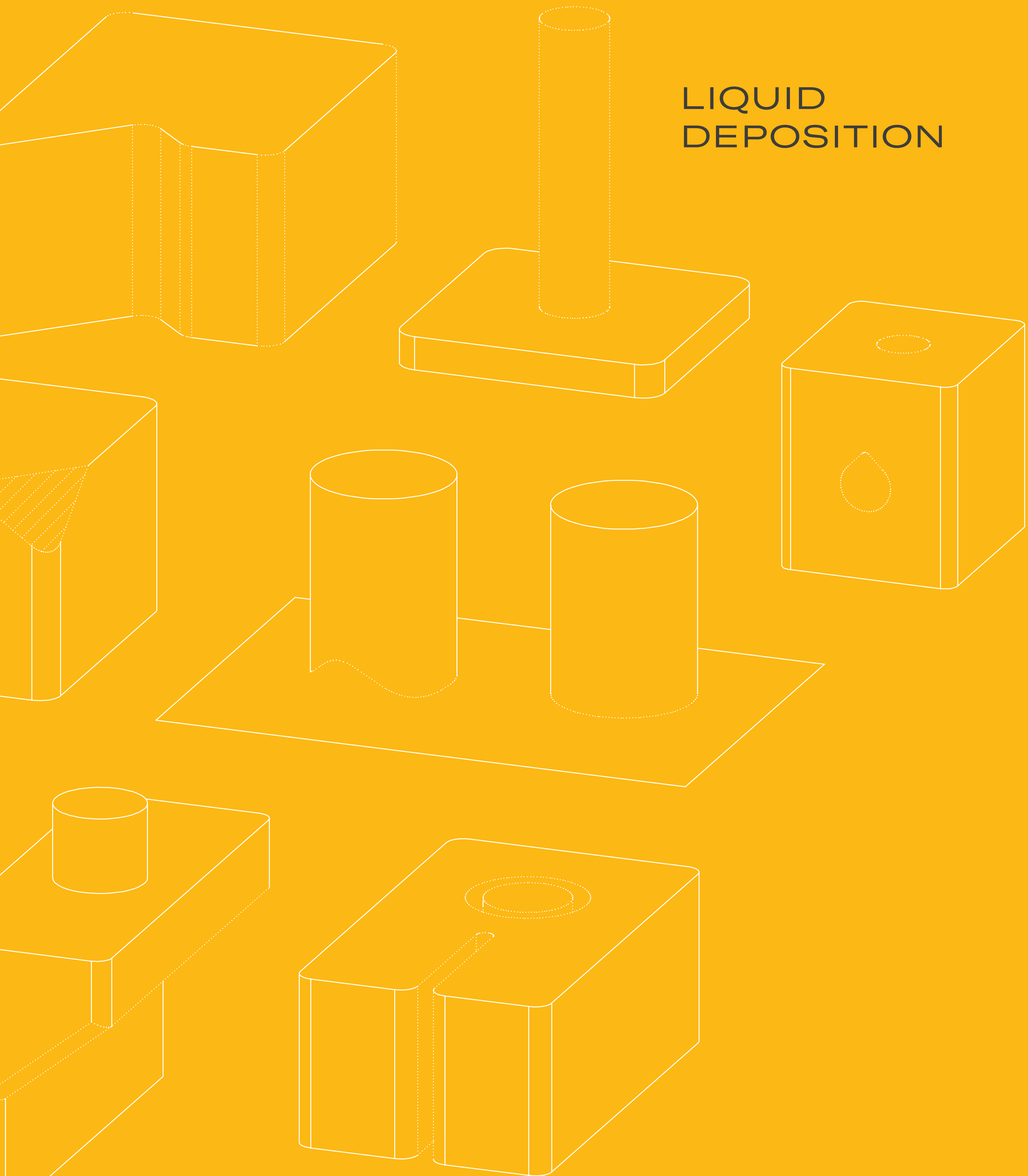
Lynxter

QUICK DESIGN GUIDE

LIQUID DEPOSITION



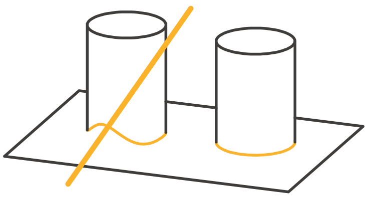
LIQUID DEPOSITION

—— Additive manufacturing of fluids and pastes should, as with all processes, be performed in accordance with design rules. In this process, fine strings of material are added layer-upon-layer to create a part.

—— This process is similar to Fused Filament Fabrication (FFF, MEX or FDM) but differs in that the string of material laid down does not ¨harden or in this case, does not “cure” in a matter of seconds. Moreover, the printed parts can be very soft and flexible and certain precautions must be taken when designing them.

—— This document provides advice and key dimensions, highlighting areas where particular care should be taken when designing your parts in order to achieve the best results when printing.

—— The design constraints listed in this document will allow you to obtain good results without preliminary testing. Note that case-by-case, these tolerance limits can be adjusted depending on part geometrics and print settings.



BUILD PLATE INTERFACE

1

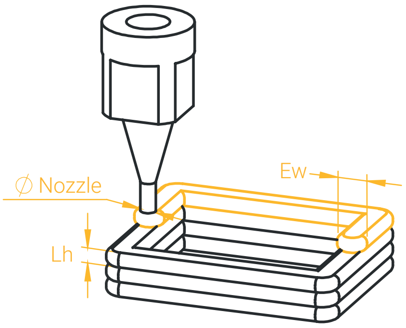
The surface in contact with the build plate should be flat.

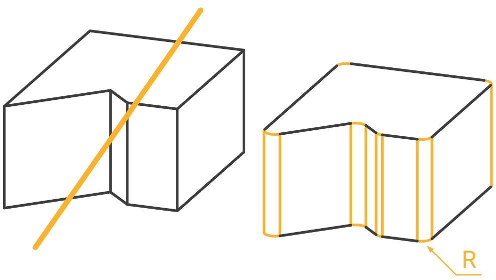
2 DIMENSIONS OF STRING

When depositing fluids, the string of material is less compressed than with thermoplastic filament; layer height is superior, whereas extrusion width is similar to the diameter of the nozzle.

0.5 x øNozzle < Lh < 0.85 x øNozzle

0.9 x øNozzle < Ew < 1.05 x øNozzle





SHARP ANGLES

3

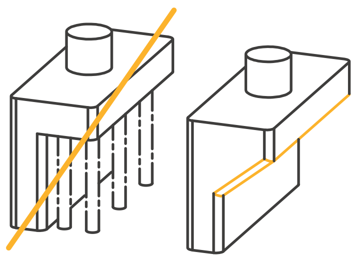
Avoid protruding edges on XY.

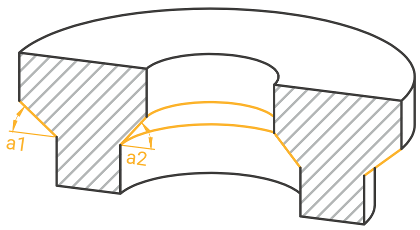
Instead use a connecting radius of:
R> 2x Nozzle diameter

4 AVOID HORIZONTAL OVERHANGS.

— Try to avoid using supports whenever possible.

— These will fuse to the part and will have to be manually removed afterwards; the supported parts will therefore have a deteriorated surface quality.





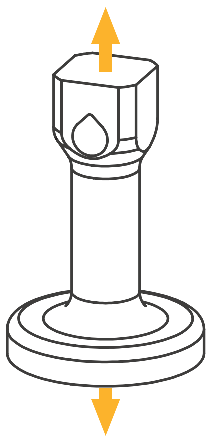
OVERHANGS 5

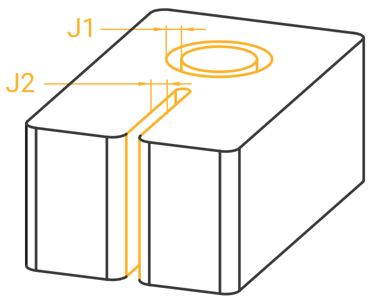
Overhangs on interior surfaces are less forgiving because the nozzle path has a tendency to drive the deposited string away from the part.

Overhangs max	RTV1	RTV2
External	a1 = 55°	a1 = 55°
Internal	a2 = 45°	a2 = 40°

6 ISOTROPY

Unlike thermoplastic parts, "liquid" parts have mechanical resistance properties on Z that are the same as on X and Y.





GAPS 7

To prevent nearby surfaces from sticking together, print with a minimum spacing of;

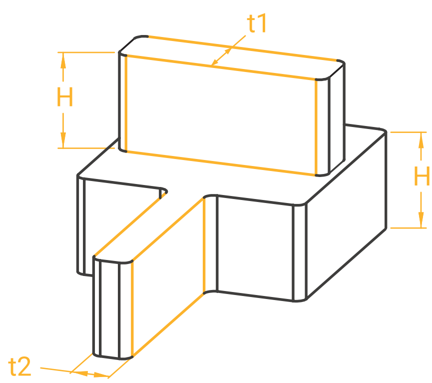
With scar*	Without scar*
J1 = 0,4 mm	J2 = 0,2 mm

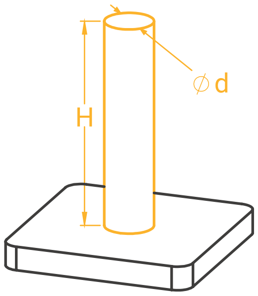
*Scar: line formed by the start and end points of strands on the outer perimeter

8 THIN WALLS

When printing with liquids, thin sections may collapse. To avoid this, respect the following dimensions:

Wall min. unsupported	Wall max. unsupported
t1 > 4 x Ønozzle / H < 5 x t1	t2 > 3 x Ønozzle / H < 10 x t2





PINS 9

Pins, like thin sections, are critical shapes and may collapse. To avoid this, respect the following dimensions:

Pins min.

Ød > 3 x Ønozzle
H < 10 x Ød

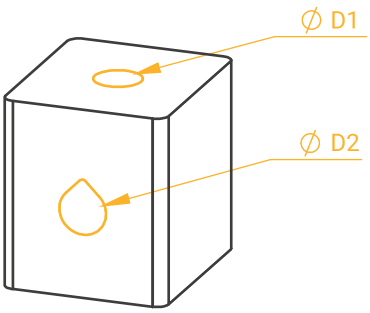
Ød > 5 x Ønozzle
H < 5 x Ød

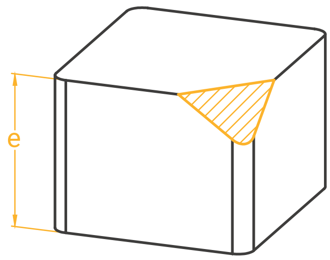
10 CHANNELS

To create an airtight channel on the side of a part, use a “droplet” or “lozenge” profile whenever possible.

This will avoid the use of supports and the strings will be oriented in the direction of the channel.

Channel min.	RTV1	RTV2
D1	> 3 mm	> 3 mm
D2	> 2 mm	> 4 mm





TOTAL THICKNESS 11

In order to ensure that parts set correctly, materials that cross-link with air contact (RTV1) are limited in total thickness.

Max total thickness t < 3 mm

12 DETAILS

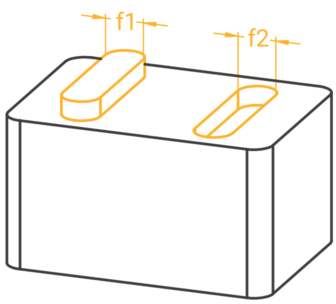
Adapt the size of the nozzle used to suit the dimensions of the part in order to optimize print time. Aim to use the largest diameter possible.

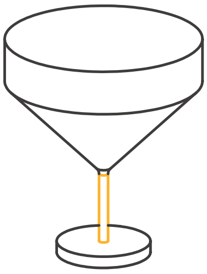
Definition and choice of nozzle diameter:

Min. details f1 > Ønozzle

f2 > 0,2 mm

Precision, tolerance ± 0,2 x Ønozzle





COLLAPSING 13

Printed liquid materials are generally of thixotropic or liquid nature at threshold, above which the part will collapse prior to curing.

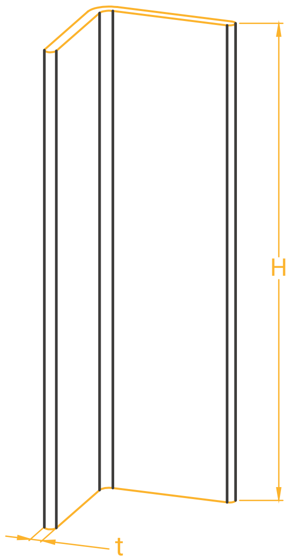
$$\frac{\textit{Weight of upper layers}}{\textit{Layer section}} < 100pa$$

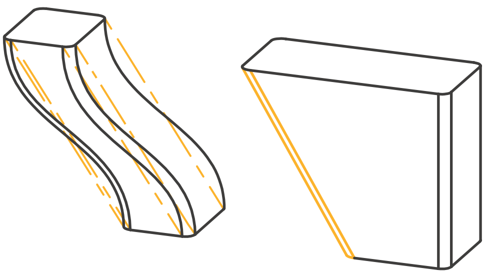
Approximation:
Section min. > 0.05 x section max.

14 BUCKLING

When printing long, thin shapes, the depositing of strings and the weight of the sections can cause the part to buckle or bend. Material depositing is less precise.

H<5 x t





CENTER OF GRAVITY 15

Even when cured, the deposited material can become deformed under its own weight. Too much weight on several sections can lead to part warping and will distort the position of the deposited string, notably if there is a big shift in the center of gravity.

The center of gravity should ideally remain located above the first layer.

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