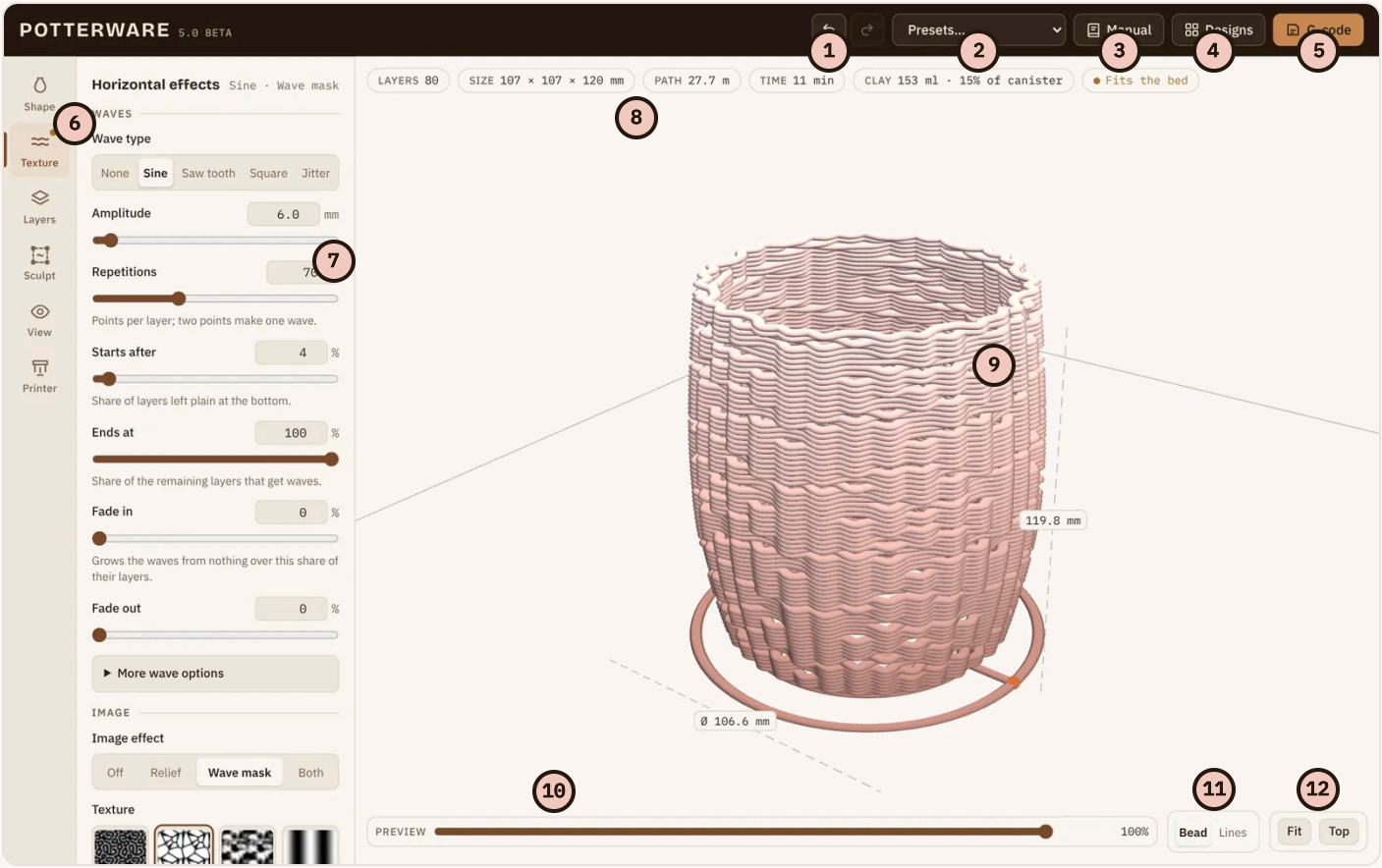
From profile to bead to G-code.

Potterware designs vessels for clay 3D printers. You shape a form, give it a surface, check the toolpath bead by bead and export a G-code file your printer can run. This manual walks through every control.

18 printers
Potterbot, LUTUM, WASP, 3D Potter

6 tool tabs
Shape to Printer

Millimetres
All sizes and distances



1. **Undo / Redo**
   Step back and forward through your changes.
2. **Presets**
   Start from one of eight finished designs.
3. **Manual**
   Download this manual as a PDF.
4. **Designs**
   Save, reopen and share your own designs.
5. **G-code**
   Opens the export sheet.
6. **Tool tabs**
   Shape, Texture, Layers, Sculpt, View, Printer. A dot marks a tab with active effects.
7. **Controls**
   Every slider has a number box for exact values.
8. **Status chips**
   Layers, size, path length, time, clay and bed fit.
9. **3D preview**
   The real toolpath, drawn as a bead of clay.
10. **Preview scrubber**
    Plays the print back layer by layer.
11. **Bead / Lines**
    Solid clay or thin toolpath lines.
12. **Fit / Top**
    Frame the print, or look straight down.

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02 The workspace

03 Shape

04 Texture

05 Layers, base & finish

06 Sculpt

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08 Export

09 Designs & presets

10 Troubleshooting

A Reference

Potterware 5.0 is beta software. It is still in development and may contain errors, incomplete features or unexpected behaviour, including in the G-code it produces. It is provided "as is", without warranty of any kind. By using Potterware 5.0, you accept full responsibility for its use and for any results, including failed prints, damage to printers or other equipment, lost materials or lost data. Always check your toolpath and printer settings before printing. Emerging Objects is not liable for any loss or damage arising from the use of Potterware 5.0.

CHAPTER 01

Quick start

Your first print file takes about five minutes. Do the printer step first, because it sets the bed size, bead width and speeds that every other number depends on.

1

Choose your printer

Open the **Printer** tab and pick your machine. Check that the nozzle and canister sizes match yours. Potterware remembers this in your browser.

2

Start from a preset

Pick one from **Presets…** at the top, or keep the default studio vase. Presets change the design but leave your printer alone.

3

Shape the form

In **Shape**, set the height and maximum diameter, then drag the profile handles sideways or up and down, adding points where you want more curves.

4

Add a surface

In **Texture**, add waves, an image relief or vertical ripples. The preview updates as you go.

5

Check the print stats

The stats above the preview should read **Fits the bed**, and the clay estimate should fit your canister.

6

Export

Press **G-code**, name the file and download it. Scrub the preview first if you want to watch the print play back.

CHAPTER 02

The workspace

The left side holds the controls, grouped into six tabs. The right side is a live preview of the exact path the nozzle will travel.

Moving around the preview

- **Orbit** by dragging with the left mouse button or one finger.
- **Pan** by dragging with the right mouse button, or with two fingers.
- **Zoom** with the scroll wheel or by pinching.
- **Fit** frames the whole print. **Top** looks straight down, which is the best view for checking base patterns and the seam.

Undo and redo

The arrow buttons at the left of the top bar step back and forward through your changes, up to 100 steps. A whole slider drag or handle drag counts as one step, and choosing a preset or opening a design can be undone too. A short note tells you what each step changed, for example **Undo: Amplitude**. Display settings such as the clay color and Bead or Lines are not part of the history.

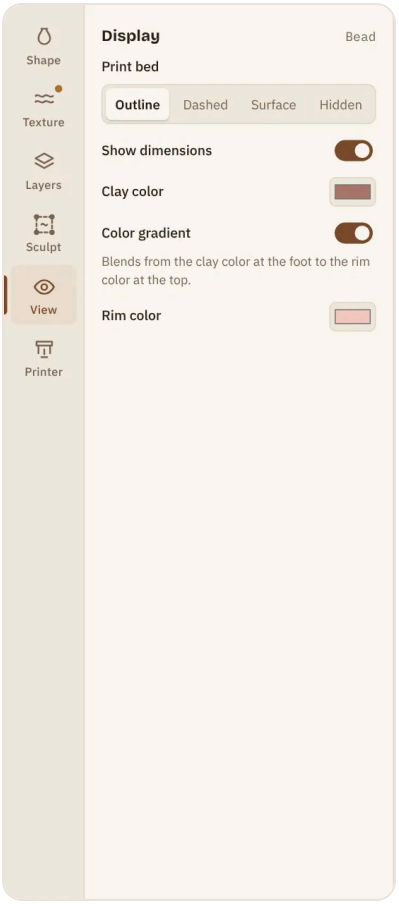
Bead and Lines

Bead draws the toolpath as solid clay at the width and height the printer will actually lay down, so you can judge surface texture and overhangs. **Lines** draws the bare path, which is faster to inspect on very large prints and shows travel moves clearly.

Display settings

The **View** tab changes only how the preview looks. None of it affects the G-code.

Print bed	Show the print area as an outline, a dashed line or a surface, or hide it.
Show dimensions	Labels the width, depth and height of the print in millimetres.
Clay color	The color of the clay in the preview. `Default #a9776a`
Color gradient	Blends from the clay color at the foot to the rim color at the top. Turn it off for one color all the way up. `On`
Rim color	The color at the top of the wall when the gradient is on. `Default #f2c9bf`



The View tab with the default clay and rim colors.



Lines mode shows the bare toolpath, color-graded from base to rim.

Preview scrubber

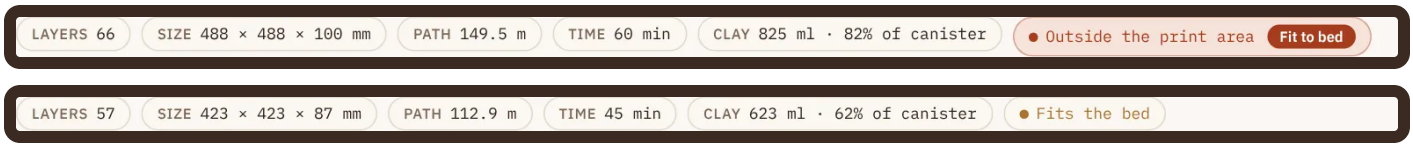
Drag **Preview** to play the print back from the first bead. The percentage is the share of the toolpath drawn. Stop it partway to inspect a base pattern, the seam ramp or the layer where a wave starts.

Status chips

The chips across the top summarise the current design. They update after every change.

Layers	Number of wall layers, from the object height divided by the layer height.
Size	Width × depth × height of the printed wall in millimetres, including waves and relief.
Path	Total length of extruded clay in metres.

Time	Estimated print time from the path length and your printer's feed rate.
Clay	Clay volume and the share of one canister it needs. Over 100% means you will refill mid-print. See Clay and bead size.
Bed fit	**Fits the bed** when every point lies inside your printer's print area, otherwise a warning with a **Fit to bed** button.



Fit to bed re-centres the print on a rectangular bed and scales the form down just enough to fit. On a SCARA it moves the print to the middle of the reachable ring. If even that is not enough, it tells you to use fewer copies or a smaller skirt offset.

Shape

A Potterware form is a profile spun around a vertical axis. You can also print the outline of your own 3D model.

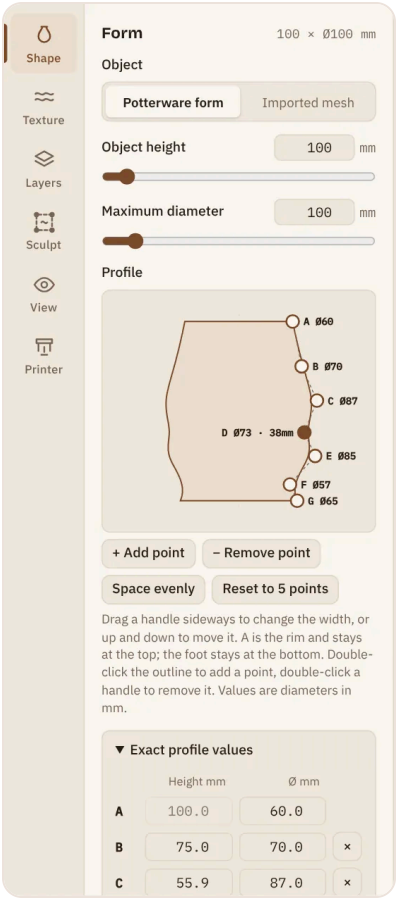
The profile

The profile is a curve shaped by 2 to 12 handles, lettered from **A** at the rim down to the foot. Each label shows the diameter there in millimetres. A new design starts with five evenly spaced points.

- **Drag sideways** to widen or narrow the wall at that point.
- **Drag up or down** to move a point to a new height. The selected point shows its height in mm. The rim and the foot always stay at the top and bottom.
- **Add a point** by double-clicking the outline at the height you want, or press **+ Add point** to place one in the biggest gap. It picks up the current width there, so the shape barely changes until you move it.
- **Remove a point** by double-clicking its handle, or select it and press **– Remove point** or `Delete`. Remove them all to leave just the rim and foot for a straight wall.
- **Space evenly** spreads the points to equal heights. **Reset to 5 points** returns to the original layout.

The handles pull the curve toward them so the wall stays smooth. To make the outline pass straight through every point, set **Vertical profile** to **Angular**.

Maximum diameter scales the whole profile at once. To type exact heights and diameters, open **Exact profile values**, which lists every point with an × to remove it and **+ Add point** at the bottom.



A seven-point profile. The selected point, D, shows its height: 38 mm.

Object height
`4–1500 mm`

Height of the wall before scaling.
`Default 100`

Maximum diameter
`1–1000 mm`

The diameter a handle reaches at 100%.
`Default 100`

Vertical profile	**Smooth** draws a soft curve guided by the handles. **Angular** joins the points with straight lines that pass through each one, for a faceted silhouette.
Object sides `3–360`	How many sides the form has in plan. Use 3–8 for polygonal pots and 100 or more for round ones. `Default 100`
Horizontal profile	**Smooth** rounds the corners between sides. **Angular** keeps them sharp.
Object twist `0–1800°`	Rotates each layer a little more than the last. The total twist is reached at the rim.

Imported mesh

Choose **Imported mesh** and upload an `.obj` or `.stl` file. Potterware slices it into layers and prints the outer outline of each slice. Set **Up axis of file** to match the program you exported from. Most STL files are Z up, and many OBJ files are Y up. **Use sample** loads a test vase.

> **Tip.** Uploaded meshes can have up to 150,000 triangles. If yours is bigger, reduce or decimate it in your modelling program first.

Scale

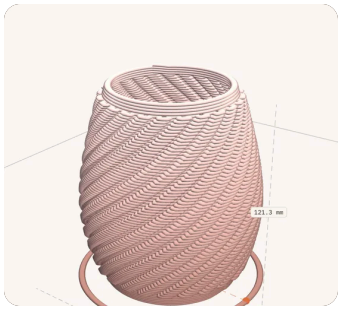
Uniform	One factor, 0.1× to 3×, for the whole print.
Per axis	Separate X, Y and Z factors, for ovals and squat or stretched forms.
To size	Type the finished width, depth and height in millimetres.

Texture

Surface effects move the wall in and out as it is printed. Horizontal effects work around each layer. Vertical effects lift and lower the layers themselves.



Sine waves
64 repetitions, 4 mm



Square, offset
60 per layer, spirals

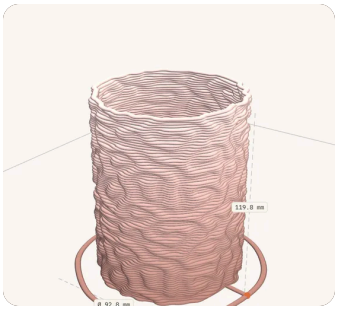


Image relief
Coral texture, 3 mm

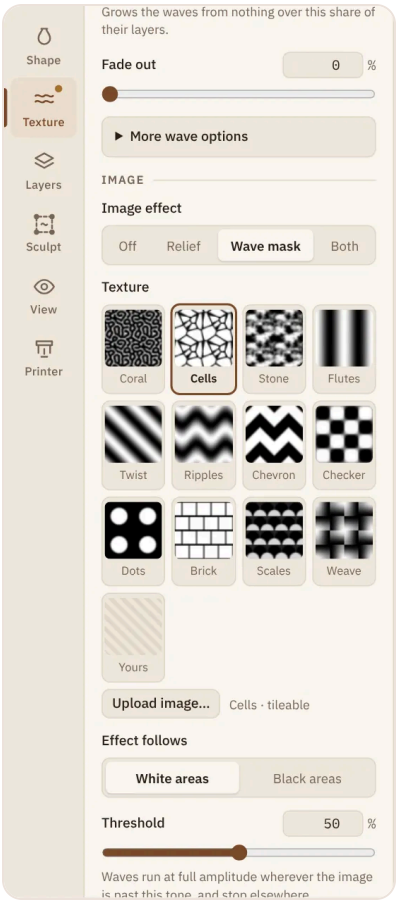


Vertical sine
12 ripples, grows to top

Horizontal waves

Waves push the wall out and in along each layer. Pick **Sine**, **Saw tooth**, **Square** or **Jitter** (random). Change the **Jitter randomizer** number for a different random pattern.

Amplitude `1–100 mm`	How far the wall moves. It is the real distance in millimetres, and masks or relief never reduce it.
Repetitions `3–200`	Points per layer. Two points make one wave, so 30 gives 15 waves around.
Starts after / Ends at	The share of layers left plain at the bottom, then the share of the remaining layers that get waves.
Fade in / Fade out	Grows the waves from nothing, or shrinks them away, over this share of the waved layers.



Wave mask with the Cells texture, from the Masked ripples preset.

Wave offset per layer	Shifts the wave a little each layer, so the pattern spirals up the pot.
Interior wave offset	Moves the inner points of the wave inward, for a deeper texture.
Waved / plain layers	Alternates bands: this many waved layers, then this many plain ones.

Image effects

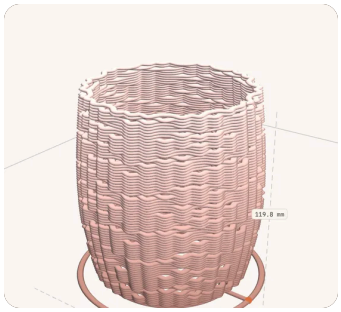
A black-and-white image wrapped around the pot can drive the surface in three ways:

Relief	Pushes the chosen areas out, or presses them in with a negative **Relief depth** (−10 to 10 mm). **Soft** edges follow the greys. **Hard** switches on at the threshold.
Wave mask	Waves run at full amplitude where the image passes the **Threshold**, and stop elsewhere. Pick a wave type above to see it.
Both	Relief and mask together.
Effect follows	**White areas** or **Black areas**. This flips the image without editing it.
Mask vertical effects too	Applies the same mask to vertical waves.

The texture library has twelve tileable patterns: Coral, Cells, Stone, Flutes, Twist, Ripples, Chevron, Checker, Dots, Brick, Scales and Weave. Choose **Yours** to upload your own image. Any photo works and is turned to greyscale. High-contrast images give the clearest results.

Placement and tiling

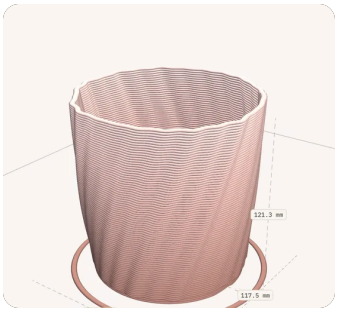
Tiles around and **Tiles up** repeat the image across the pot. **Width** is the share of the circumference the image covers, so 25% places one motif on one side. **Horizontal** and **Vertical position** slide it into place.



Wave mask
Waves only inside the cells



Weave relief
18 × 6 tiles



Jitter
with 40° twist



5 sides
144° twist, seam follows

Vertical effects

Vertical waves raise and lower the bead as it travels around each layer, so the layer lines undulate and the rim turns wavy. They have their own type, **Amplitude** (0–100 mm), **Repetitions**, start, end and fades, and run together with horizontal effects.

Effect gradient sets where they are strongest. **Grows to top** builds from nothing at the foot to the full amplitude at the rim. **Peaks in middle** swells at mid-height and calms toward both ends. Because the effect grows gradually, neighbouring layers stay close together and keep supporting each other.

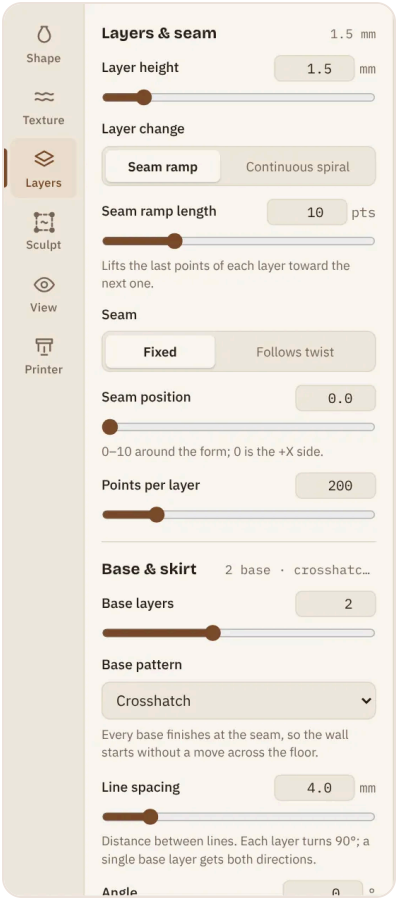
Printability. Many repetitions with a large amplitude make steep slopes in each layer, which soft clay may not hold. Raise the amplitude in small steps and check the slopes with the preview scrubber.

Layers, base & finish

These settings decide how the wall is stacked, where each layer begins, what goes underneath, and how the print starts and ends.

Layers and seam

Layer height `0.2–10 mm`	Height of each layer. It also sets the bead height. `Default 1.5`
Layer change	**Seam ramp** prints flat layers and climbs to the next one at the seam. **Continuous spiral** rises steadily all the way round, with no seam, as in vase mode.
Seam ramp length `0–40 points`	How many of the last points of each layer lift toward the next one. Longer ramps hide the seam better. `Default 10`
Seam	**Fixed** keeps the seam in one place. **Follows twist** rotates it with the form.
Seam position `0–10`	Where the seam sits around the form. 0 is the +X side, and 5 is opposite.
Points per layer `24–1000`	Resolution of each layer. Use more for fine textures and fewer for smaller files. `Default 200`



The Layers tab groups layers & seam, base & skirt, and start & finish.

Base and skirt

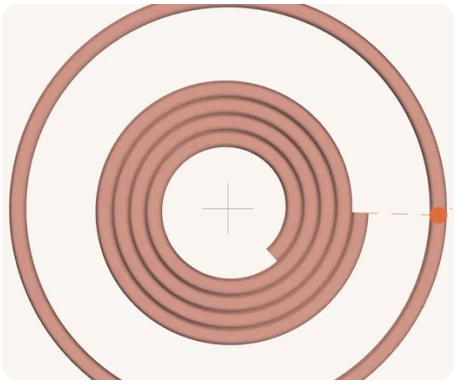
Set **Base layers** (0–5) to print a solid floor. Zero leaves the bottom open, for planters or sleeves. Every pattern finishes at the seam, so the wall starts with a short step and nothing is dragged across the floor. With several base layers, the top layer prints outward to the seam and the ones below

alternate direction, so each layer change happens in place. Five patterns are available:

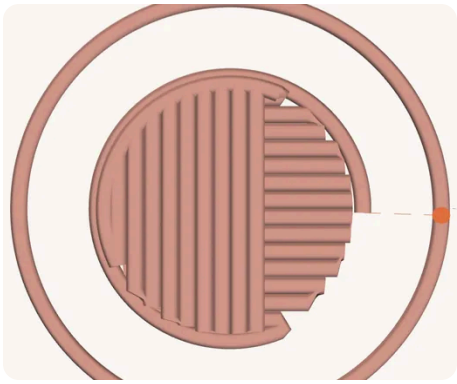
Concentric rings	The original Potterware base: rings that step out from the centre, each one starting and closing at the seam. **Base layer spacing** controls the gap.
Spiral	One continuous spiral from the centre out to the edge, finishing at the seam. It has the fewest stops and starts.
Parallel lines	Back-and-forth lines at your chosen **Angle**. **Turn each layer by** rotates the next layer.
Crosshatch	Lines that turn 90° on each layer. A single base layer gets both directions.
Sunburst	Spokes from the centre to the wall, arranged so the last spoke and the outline finish at the seam.

Line spacing (1–20 mm) sets the gap between lines or spiral turns. **Finish with an outline ring** seals the edge of line patterns. **Scale base** shrinks or grows the floor relative to the foot, so 0.95 tucks it slightly inside the wall.

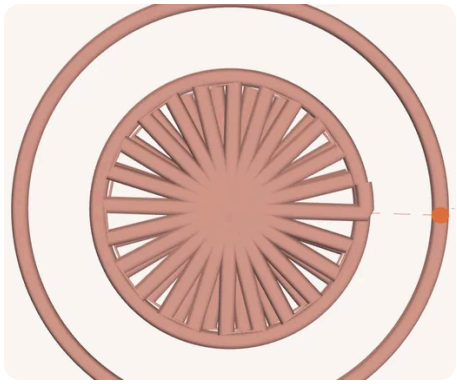
The **skirt** is a loop around the print, drawn first to get clay flowing. **Skirt offset** is its distance from the foot. `Default 17 mm`



Spiral



Crosshatch (one layer shown)



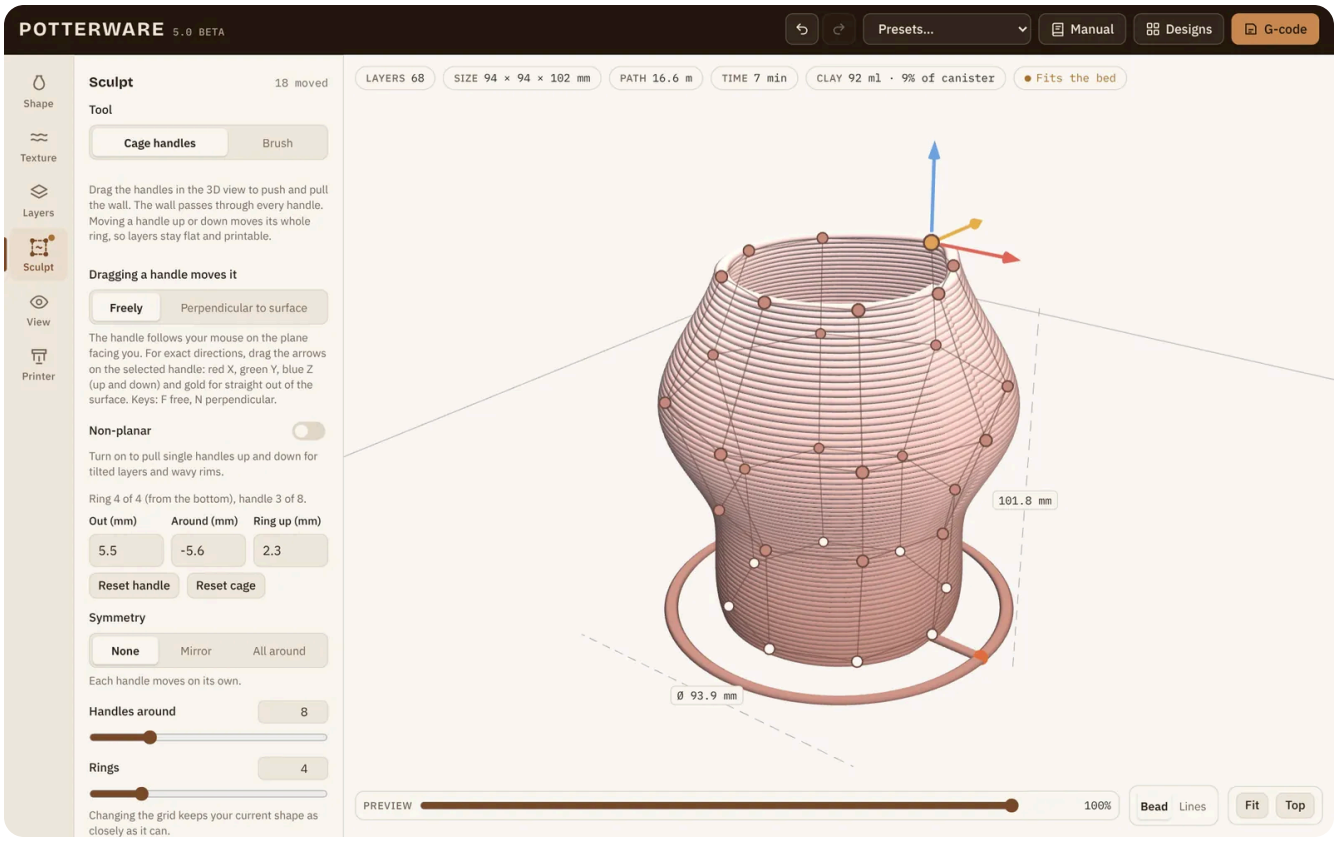
Sunburst

Start and finish

Prime before the skirt	Extrudes a set length of bead in place at the start point (**Prime amount**, 1–150 mm), so clay is flowing before the skirt begins.
Wipe off the rim	At the end, moves inward off the wall without extruding (**Wipe distance**), then lifts (**Lift**). This keeps the nozzle from dragging a blob across the rim.

Sculpt

Sculpt the wall two ways. The **cage** is a ring of handles wrapped around the form that bends the whole wall, the way you would nudge a pot on the wheel. The **brush** paints pushes and pulls straight onto the surface. Choose between them with **Tool** at the top of the tab.



A selected handle shows four arrows: red X, green Y, blue Z and gold out of the surface. The panel shows its exact offsets.

Moving handles

- **Drag a handle** in the 3D view. With **Freely**, it follows your mouse on the plane facing you. With **Perpendicular to surface**, it slides only straight in and out of the wall.
- **Drag an arrow** on the selected handle to move in one exact direction: red X, green Y, blue Z (up and down) or gold straight out of the surface.
- **Type exact values** in **Out**, **Around** and **Ring up** (all in mm) for the selected handle.
- Moving a handle up or down moves its whole ring, so layers stay flat and printable. To move single handles up and down, turn on **Non-planar**.

Symmetry and grid

None	Each handle moves on its own.
Mirror	Moves are mirrored across the X axis.
All around	Every handle on a ring moves together. This is the quickest way to make a belly, neck or flare.
Handles around / Rings	3–24 handles per ring and 2–12 rings. Changing the grid keeps your current shape as closely as it can. `Default 8 × 4`

Reset handle puts the selected handle back, and **Reset cage** clears all cage sculpting. The Sculpt tab shows a dot while any handle is moved or brushwork is painted. Sculpting also applies to multi-print copies, but you need to turn multi-print off to edit it.

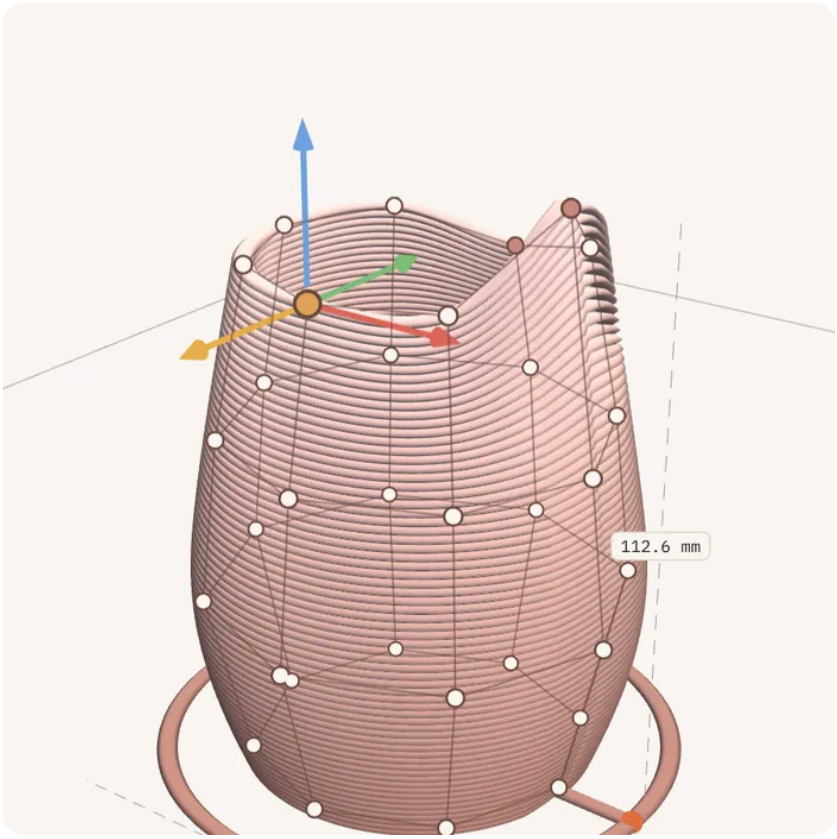
Non-planar sculpting

With **Non-planar** on, each handle moves up and down on its own. Drag the blue arrow, drag the handle freely, or type a value in **Up (mm)**. The layers tilt around the raised and lowered handles, and the rim can wave.

- The bottom ring always stays on the bed, so the first layers print flat.
- A handle can't pass the rings above or below it.
- If moves are steep enough to spread neighbouring layers too far apart or squeeze them too close, a note shows the actual gaps. Keep them between half and one and a half times your layer height: 0.75 to 2.25 mm with 1.5 mm layers.
- Turning it off brings back flat layers. Your up and down moves are kept for when you turn it on again.



Tilted layers. The nozzle meets a tilted bead at an angle. Gentle waves print well on most clay printers; steep tilts can make the nozzle drag through the layer below.



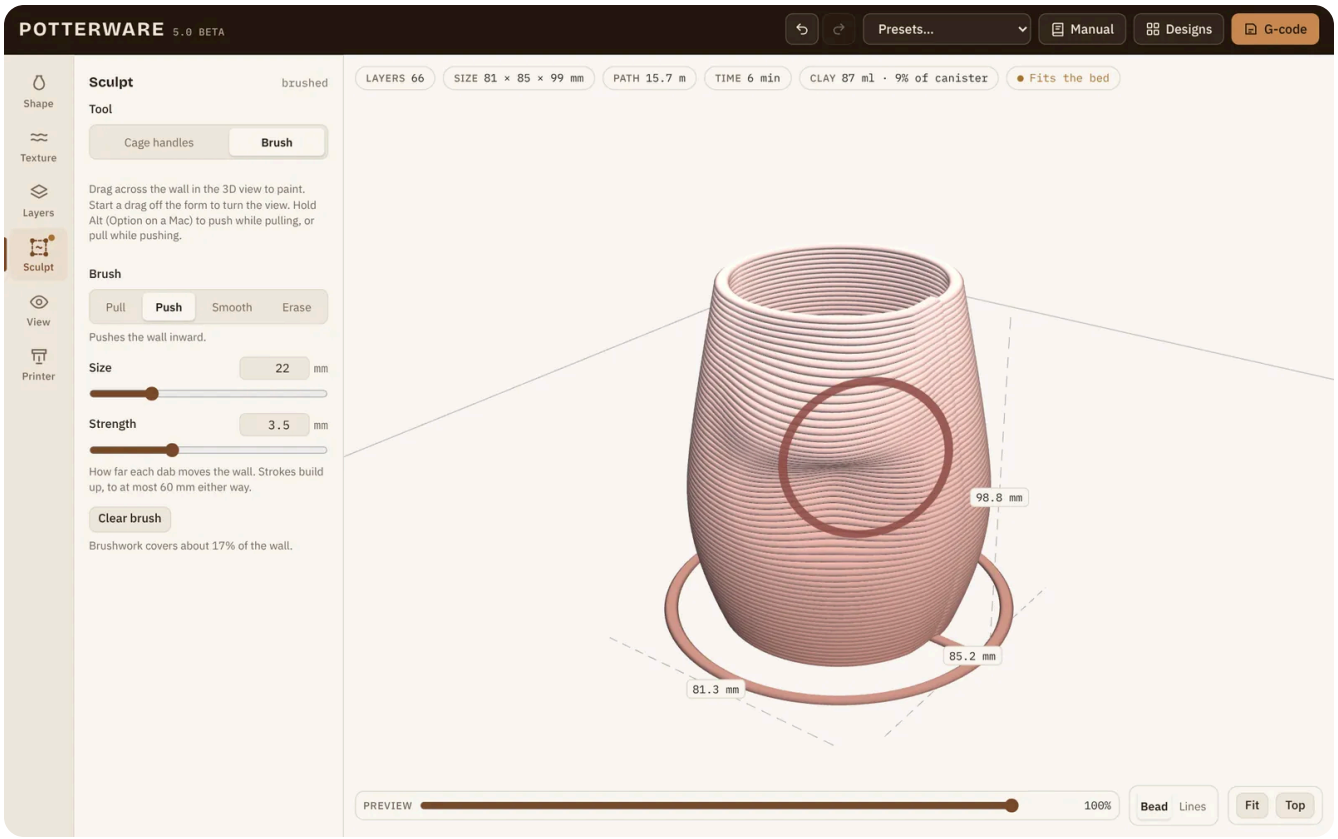
Two handles on the top ring raised 14 mm and two lowered 6 mm.

Sculpt brush

Set **Tool** to **Brush**, then drag across the wall in the 3D view. A ring shows the brush where it touches the wall. Start a drag off the form to turn the view as usual.

Pull	Pulls the wall outward.
Push	Pushes the wall inward. Hold `Alt` (`Option` on a Mac) while painting to swap Pull and Push.
Smooth	Evens out bumps and dents.
Erase	Takes brushwork away, back toward the original shape.
Size `3–80 mm`	The radius of the brush. `Default 15`
Strength `0.2–10 mm`	How far each dab moves the wall. Strokes build up, to at most 60 mm in or out. `Default 1.5`

Each stroke undoes in one step, and **Clear brush** removes all brushwork. Brushwork stays in place when you change the height, diameter or profile. It is painted onto the finished wall, so if you add or change twist afterwards it won't turn with the form.

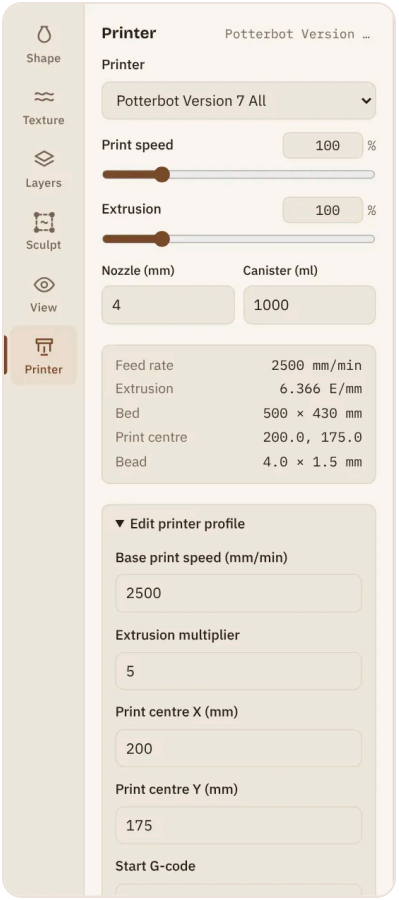


A pulled wave across the middle and a pushed dent below it, painted with a 22 mm brush.

Printer & clay

Your printer setup is saved in your browser on its own, so loading a preset or a design never changes it.

Printer	Sets the bed shape and size, start and end G-code, base feed rate and extrusion multiplier.
Print speed `0–500%`	Scales the printer's base feed rate.
Extrusion `0–500%`	Scales how much clay is pushed per millimetre. It also widens the bead in the preview and the clay estimate.
Nozzle `mm`	Nozzle diameter. It sets the bead width. `Default 4`
Canister `ml`	How much clay one load of your extruder holds. `Default 1000`
SCARA position	3D Potter Scara only: where on the reachable ring the print is centred.



Potterbot Version 7 All: 2500 mm/min, 6.366 E per mm, a 4.0 × 1.5 mm bead.

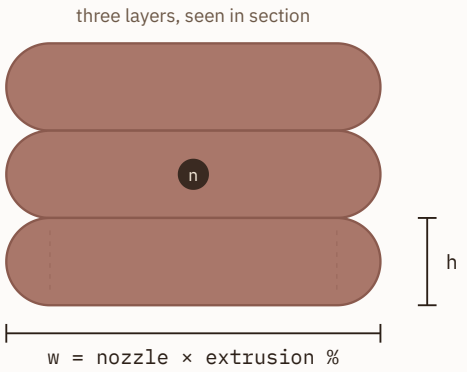
Edit printer profile

Fine-tune the selected printer: base print speed (mm/min), extrusion multiplier, print centre X and Y, start G-code, end G-code, and an optional **pause command** to insert when the clay runs out, such as `M0` or `M600`. **Restore printer defaults** undoes your edits.

Export profile saves your tuned printer as a small file you can send to a colleague or keep as a backup. **Import profile** loads one.

Clay and bead size

Potterware works out the bead you will actually print, then uses it for both the preview and the clay estimate.



Bead width (never thinner than the layer)

$$w = \max(h, \text{nozzle} \times \text{extrusion}\%)$$

Bead cross-section: a flat middle and rounded edges

$$\text{area} = (w - h) \cdot h + \pi \cdot h^2 / 4$$

Clay needed

$$\text{volume} = \text{path length} \times \text{area}$$

$$\text{weight} \approx \text{volume} \times 1.9\ \text{g/ml}$$

For example, a 4 mm nozzle at 100% extrusion with 1.5 mm layers gives a 4.0 × 1.5 mm bead with a cross-section of about 5.5 mm². A 27.7 m path then needs about 153 ml of clay.

When a print needs more than one canister, the preview marks each refill point with a ring on the wall. The G-code gets a `; REFILL CLAY HERE` comment at that point, followed by your pause command if you set one. The export sheet lists the heights where each refill falls.

> **Tip.** The estimate assumes the clay comes out at the bead size shown. If your prints use more or less clay than predicted, change **Extrusion** until the preview bead matches a measured print.

Multi-print

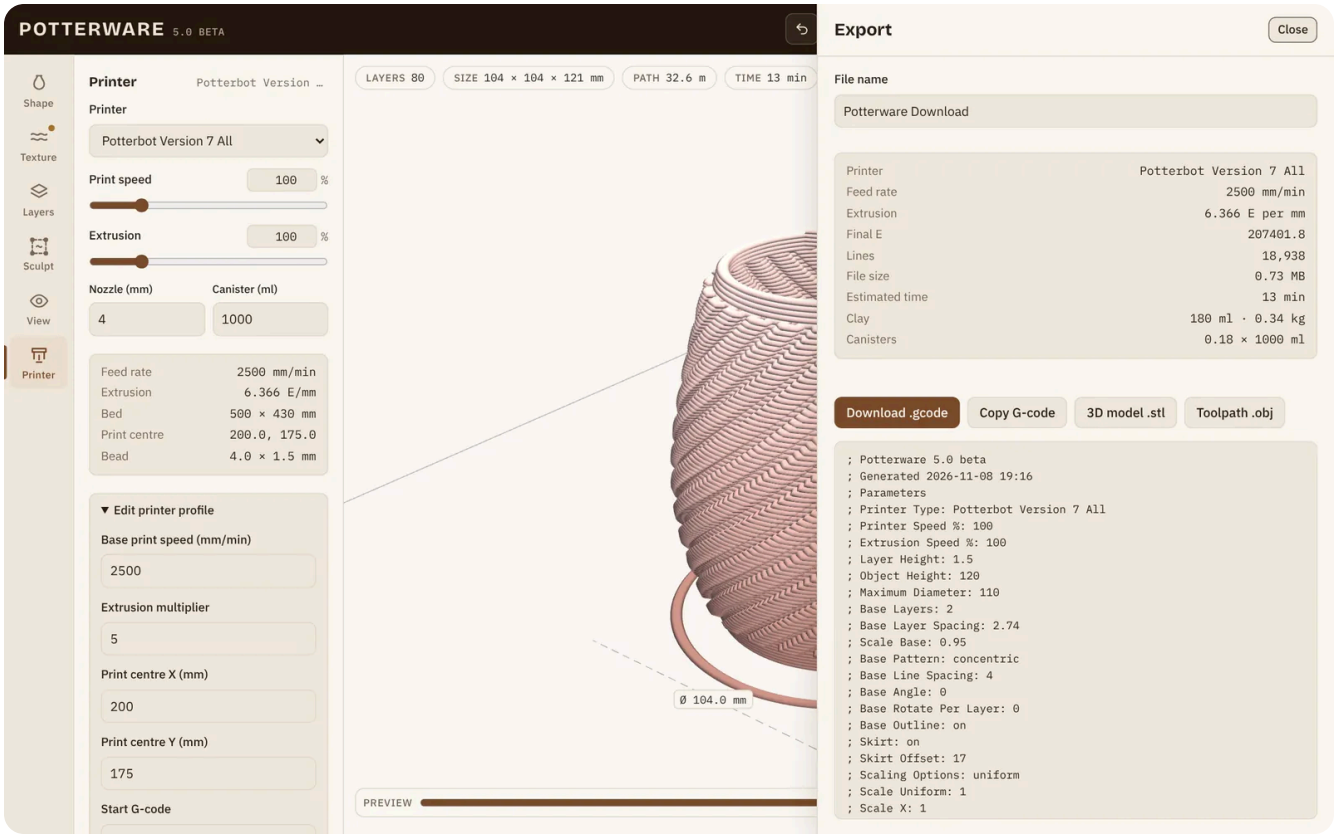
Turn on **Print several copies** to lay out a grid, up to 10 × 10. **Gap between copies** sets the spacing. **Lift between copies** raises the nozzle for each move. **Extrude while moving between copies** keeps clay flowing during those moves, which some extruders need to avoid a dry start.

Supported printers

FAMILY	MODELS	PRINT AREA	BASE FEED
Potterbot	Standard	500 × 430 mm, centred	1500 mm/min
	Version 7 All	500 × 430 mm	2500 mm/min
	9 Standard	420 × 360 mm	1500 mm/min
	9 Micro · 9 XL	250 × 260 · 500 × 460 mm	3000 mm/min
	10 Micro · 10 Pro · 10 Super · 10 XL	280 × 265 · 415 × 405 · 415 × 405 · 490 × 490 mm	3000 mm/min
LUTUM	4M · v4.5 · v4.5 Pro · 5	430 × 450 mm	3000 mm/min
Delta WASP	2040 · 4070	Ø 200 mm	3000 mm/min
	40100	Ø 400 mm	3000 mm/min
Keep/Czibes	Delta	Ø 200 mm	3000 mm/min
3D Potter	Scara	Ring, radius 380–860 mm	3000 mm/min

Export

Press **G-code** in the top bar. The export sheet summarises the job, shows any warnings and previews the file.



The Spiral fluted jar: 18,938 lines, 13 minutes, 180 ml of clay.

Download .gcode	The file for your printer, with your file name.
Copy G-code	Copies the whole file, for pasting into a printer's web interface.
3D model .stl	A solid model of the printed bead, for renders or a slicer check.
Toolpath .obj	The bare path as lines, for Rhino, Blender or other CAD software.

Every file starts with a commented list of all the parameters used, so you can always tell how a print was made by opening its G-code in a text editor.

Before printing. Check that the sheet shows no bed warning, that the printer named in the summary is yours, and that the clay estimate fits your canister or has refill points marked.

CHAPTER 09

Designs & presets

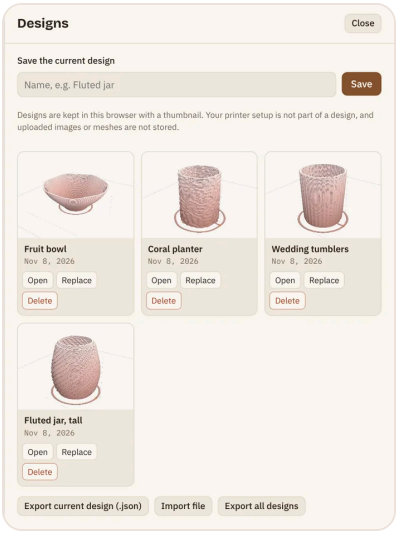
Save designs as you work, with a thumbnail, and share them as small files.

Saving designs

Press **Designs**, type a name and press **Save** (or `Enter`). Each card offers **Open**, **Replace** (overwrite it with the current design) and **Delete**.

- **Export current design (.json)** saves one design as a file.
- **Export all designs** saves your whole gallery as a single file, which makes a good backup.
- **Import file** loads either kind of file.

> **Stored in this browser.** Designs live in the browser you made them in. Clearing site data or switching computers starts you with an empty gallery, so export anything you want to keep. Your printer setup is not part of a design, and uploaded images or meshes are not stored, so upload them again after opening a design that used them.



Each saved design keeps a thumbnail and the date.

Presets

Presets are starting points. Choosing one replaces the current design but keeps your printer, file name and display settings.

PRESET	WHAT IT SHOWS
Studio vase	The defaults: a smooth 100 mm vase
Ribbed tumbler	Fine sine ribs, 4 mm deep
Twisted pentagon	Five sides, 144° twist, seam follows twist
Spiral fluted jar	Square waves offset each layer, 2 base layers
Rippled bowl	Vertical sine ripples growing to the rim
Jitter planter	Random jitter with a gentle twist
Coral relief cylinder	Image relief with the Coral texture
Masked ripples	Sine waves masked by the Cells texture
Woven relief bowl	Weave texture relief on a wide bowl

CHAPTER 10

Troubleshooting

Messages appear as a short note at the bottom of the screen. Here is what each one means and what to do.

“Your session has expired. Reload the page to keep designing.”

Potterware sessions last 12 hours. Reload the page. Your current design is saved in the browser and comes back after the reload.

The bed chip says “Outside the print area”

Press **Fit to bed**. If it still doesn't fit, reduce the maximum diameter or scale, lower the multi-print count, or reduce the skirt offset. Waves and relief add to the footprint too.

I turned on Wave mask but nothing changed

The mask shapes waves, so it needs a wave type. Pick Sine, Saw tooth, Square or Jitter under Waves. To mask vertical ripples, turn on **Mask vertical effects too**.

“Your uploaded image (or mesh) has expired”

Uploads are kept on the server for three days after their last use. Load the file again.

“That mesh has too many triangles”

Reduce the model to under 150,000 triangles in your modelling program, for example with Decimate in Blender or ReduceMesh in Rhino, and upload it again.

“You are going a little fast”

There is a per-visitor limit on previews and exports. Wait a few seconds and continue.

The export sheet asks me to sign in —

This site requires an account to export G-code. Press **Sign in**, then come back to the page. Your design will still be there.

The clay estimate doesn't match my real prints —

Make sure the nozzle size is right, then adjust **Extrusion** until the preview bead width matches a measured print. Clay density varies. The weight uses 1.9 g/ml, which suits most stoneware and earthenware bodies.

My mesh prints sideways —

Switch **Up axis of file** between Y up and Z up in the Shape tab.

Reference

Keyboard

Undo	`Ctrl` `Z` · Mac `⌘` `Z`	Redo	`Ctrl` `Y` · Mac `⇧` `⌘` `Z`
Switch tool tab	`↑` `↓` on the tab rail	Sculpt: drag freely	`F`
Brush: swap Pull and Push	hold `Alt` / `Option`	Sculpt: drag perpendicular	`N`
Deselect handle	`Esc`	Close export or designs	`Esc`
Save design	`Enter` in the name field		

Glossary

Bead

The coil of clay the nozzle lays down. Its width comes from the nozzle and extrusion, and its height from the layer height.

Seam

The point where each layer starts and ends, and where the nozzle steps up.

Skirt

A loop printed around the piece first, to start the clay flowing.

Prime

Clay pushed out in place before the skirt.

Wipe

A dry move off the rim at the end of a print.

E value

The extruder position in G-code. Potterware writes absolute E, growing along the path.

Feed rate

Nozzle speed in mm/min: the printer's base feed times Print speed.

Canister

One load of clay in your extruder, in ml.