Real-time Double Reed Shaper 3D Modeling

CurvaSURE Shaper Generator User Manual v1.0

Welcome to CurvaSURE! This application empowers you to design and generate precise 3D printable straight shaper forms for various double reed instruments. It offers a balance of pre-defined presets for quick starts and extensive customisation options for unique designs.

1. Getting Started

Upon launching the application, you'll see a main window divided into two sections:

- **Left Panel (Control Panel):** Contains all the input fields, parameters, and action buttons. This is where you define your shaper.
- **Right Panel (Preview Area):** Displays a real-time 2D visual representation of your shaper as you adjust parameters.

2. Main Sections

2.1. Shaper Parameters

This section allows you to define the fundamental dimensions of your shaper.

- **Preset:**
    - **Select a Preset:** This dropdown menu provides a comprehensive list of pre-defined shaper profiles categorised by instrument (e.g., Bassoon, Baroque Bassoon, Contrabassoon, Contraforte). Selecting a preset will automatically populate all relevant parameters and shape points, giving you a great starting point.
    - **Online Presets:** The application automatically checks for and downloads new or updated presets from an online repository. You can also manually

trigger a check using the "Check for Updated Presets Now" button in the Preset menu.

    - **Export Custom Preset:** Once you've designed a custom shaper you're happy with, use this feature to save all its parameters and shape points to a .json file. This allows you to easily recall your custom design later or share it with others. ***Important:*** *No custom presets are stored in the program memory, only locally on your hard drive.*

    - **Load Custom Preset:** Use this to load a previously saved .json preset file.

- **Total Length (mm):** Defines the overall length of the cane blank for which the shaper is designed. This directly influences the overall length of the generated shaper.

- **Gouge Diameter (mm):** Specifies the diameter of the gouged cane from which the reed will be made. This is crucial for accurate shaper design.

- **Generate Guide Indents (Recommended):** This checkbox controls whether small physical indents are included at the tip and butt of the shaper. These indents serve as visual and tactile guides for accurate cane placement and folding. It is generally recommended to keep this enabled.

Uneditable Parameters (For Visual Reference)

These parameters are set for maximum compatibility with the shaper structure and are displayed for your reference.

- **Shaper End Buffer (mm):** This value adds extra material beyond the functional blade section of the shaper. This buffer provides stability during the shaping process and allows for better clamping in a shaper handle.

- **Screw Hole Diameter (mm):** Sets the diameter for the mounting holes on the shaper. The default value of **4mm** is set for maximum compatibility with the shaper structure.

- **Screw Hole Offset from End (mm):** Determines the distance of the screw holes from the ends of the shaper.

2.2. Advanced Features

- **Enable Gouge Width Compensation:** All the measurements in this program are taken from shapers, either straight or fold over versions. Each one of those shapers has an inherent gouge built into it. Ticking the box here will adjust the shaper size based on what you have set as your own gouge diameter. The intention is to give the use the most accurate shape, regardless of their gouge settings.

    - ***Example:*** If you are based in the USA, you most likely gouge with a 25mm diameter blade. If you want to use the Rieger 1A shape (which is configured to the assumed European standard of 26mm), the output of that shape will be slightly different due to the way the cane sits in the shaper.

- Ticking *Enable Gouge Width Compensation* will calculate based on the original gouge of the shape the measurements were taken from and will adjust your shaper to be more faithful to the original shape.
- *Note: If you switch to another preset (unless loading in one of your own), this box will reset. This is to ensure that the user consistently wants the compensation applied, as it does fundamentally change the geometry.*
- This setting *will* be saved if you export a preset.

2.3. Shape Points (Customisation Hub)

This is where the true flexibility and power of the Shaper Generator shine, allowing you to define highly custom shaper profiles. The shaper's profile is determined by a series of (Distance from Tip, Width) points.

- **"0 (Tip - Required)":** This is the starting point of your shaper profile, representing the width at the very tip of the cane. This point cannot be removed.
- **Intermediate Points:** These are user-defined points along the length of the shaper.
  - **Add Point:** Click this button to add a new intermediate point row. You'll enter a "Distance from Tip (mm)" and a "Width (mm)".
  - **Remove Point:** To remove an intermediate point, first **click on either the "Distance from Tip" or "Width" field** of the specific intermediate point you wish to remove. Once selected (the field will have focus), click the "Remove Point" button. You cannot remove the "Tip" or "Butt" required points.
  - **Distance from Tip (mm):** This value specifies how far along the shaper's length (from the tip) the point is located.
    - **Accepted Range:** Values must be between **0mm and 95mm**.
  - **Width (mm):** This value defines the width of the cane at the specified distance from the tip of the reed.
    - **Accepted Range:** Values must be greater than **0mm and up to 30mm**.
    - **Important:** Ensure all width values are positive.
- **"(Butt - Required)":** This is the final point of your shaper profile, representing the width at the butt end of the cane. Its "Distance from Tip" is automatically calculated as half of the "Total Length (mm)". This point cannot be removed.
- **Input Validation:** The application performs real-time validation of your input values. If a value is outside the accepted range or in an invalid format, the input field will turn red, and an error message will appear in the preview area or via a pop-up.

2.4. Curve Options

This section controls how the application interpolates between your defined shape points.

- **Smooth Curve (Recommended):** This option uses a spline interpolation method to create a smooth, continuous curve between your defined points. This is generally recommended for most shaper designs as it produces a more organic and flowing profile.
- **Straight Lines:** This option connects your defined points with straight line segments. This can be useful for creating more angular or segmented shaper profiles.

2.5. Preview Controls

The right panel provides a visual preview of your shaper.

- **Show Preview:** Toggles the visibility of the 2D shaper preview.
- **Show Guide Marks:** Toggles the display of helpful visual guides on the preview:
    - **Red Dashed Line:** Represents the centre line of the shaper.
    - **Green Dashed Lines:** Mark the butt end of the shaper.
    - **Orange Dashed Lines:** Indicate the narrowest point of the shape.
- **Auto-update:** When enabled, the preview will automatically regenerate in real-time as you modify parameters or shape points.
- **Generate Preview:** If "Auto-update" is disabled, click this button to manually refresh the preview.

2.6. Action Buttons

- **Generate Preview:** (Same as above, for manual updates).
- **Generate Files:** This is the core function for exporting your shaper design.
    - Clicking this button will prompt you to choose a save location.
    - The application will generate two files:
        - **STL (.stl):** A 3D model file suitable for 3D printing. The generated STL will include two mirrored shaper halves and a connecting base, ready for printing.
        - **DXF (.dxf):** A 2D CAD file representing the outline of your shaper, useful for laser cutting or further CAD work.
    - **Error Handling:** The application will validate all parameters before generation. If any required parameters are missing or values are invalid, an error message will be displayed.
- **Help:** Links back to this very manual!

3. Tips for Best Results

- **Validate Inputs:** Always ensure your numerical inputs are within the accepted ranges. Invalid inputs can lead to unexpected or unprintable shapes.
- **Preview Regularly:** Even with auto-update, occasionally review the preview to ensure the shape is developing as intended.
- **Understand Your Cane:** The ideal shaper profile depends heavily on the specific cane you are using (its thickness, density, and natural curve). Experimentation and iterative design are key.
- **3D Printing Considerations:** When generating STL files, remember that the final print quality will depend on your 3D printer's capabilities and slicer settings. Ensure you use appropriate materials and print resolutions.

4. Troubleshooting

- **"Input Error" / "Plotting Error":** Check the values you've entered in the "Shaper Parameters" and "Shape Points" sections. Look for red-highlighted fields.
- **"Cannot Remove Point":** Remember you can only remove intermediate points, not the "Tip" or "Butt" required points. Ensure you've clicked on an intermediate point's field to select it before attempting to remove.
- **"Failed to generate files":** This usually indicates missing or invalid parameters. Review all fields, especially those related to "Total Length", "Gouge Diameter", and "Screw Hole" dimensions.
- **No Logo/Icon:** If the logo or icon doesn't appear, it simply means the image files are not found in the expected location. The application will still function normally.
- **"Connection Error" / "Data Error" for Presets:** This indicates an issue connecting to the online preset server or a problem with the downloaded data. Check your internet connection.