



USER MANUAL

Carvect Pro

Version 3.6.2, for Windows and macOS.

SMEPoint LLC · carvect.com · support@smepoint.com

Contents

1 Getting started

What you need
Creating your account
Downloading
Installing on Windows
Installing on macOS
The first time it opens
The trial

Buying a licence
Getting the licence into the application
The Account & Licence window
Two computers per licence
A computer with no internet
Your account page on carvect.com
Updating

2 The workspace

The Home page
How the window is laid out
The ribbon and the four stages
The menu bar
The side panels
The 2D and 3D views

The status bar
Projects
Opening and saving
Autosave and crash recovery
Preferences
Help while you work

3 Setup

Why setup comes first
Job Setup
Machines
Post-processors
The Tool Database

The Material Database
Templates
Sheets
Double-sided jobs
Nesting

4 Design

Vectors, open and closed
Selecting
Drawing tools
Text
Filletts and offsets
Moving, turning and sizing
Editing vectors

Grouping, arrays and alignment
Measuring
Layers
The Properties tab
Importing drawings and pictures
The Profiles library

5 3D models

How Carvect Pro carves a model
Importing a model
Face up, rotation, size and position
Model position and the Z plane

Reducing a mesh
Slicing a tall model
Reliefs from the Profiles library
Looking at a model in 3D

6 Toolpaths

Making a toolpath
The tool bit
Settings most toolpaths share
Profile
Pocket
2D Adaptive Clearing

Trochoidal Clearing
Surface
Chamfer
Round Over
Fluting
Drill

Engrave
V-Carve
Inlay
Photo V-Carve
Sketch Carving

Prism
3D roughing
3D finishing
The Toolpaths list
Operations

7 Previewing before you cut

Why preview at all
Toolpaths as lines
Running the simulation
The playback controls
Dropping the waste

Saving a picture
Estimate Time
Check Gouges
The job sheet
Out-of-date toolpaths

8 Output and the first cut

Exporting G-code
The export window
Tools and tool changes
The machine envelope check

Exporting a double-sided job
Running a new job
Other files you can write

9 Problems and shortcuts

Drawing and importing
Toolpaths
The preview
G-code and the machine

Licence and account
If the application closes unexpectedly
Getting help
Keyboard shortcuts

Getting started

Making an account, downloading and installing Carvect Pro, the trial, buying a licence and getting it onto your computers, and keeping the application up to date.

What you need

Carvect Pro runs on Windows and on macOS. One licence covers both, so a Windows machine in the workshop and a Mac at home can share it.

Windows	Windows 10 or 11, 64-bit.
macOS	macOS 13 Ventura or later, on Apple silicon (M1 or newer). Intel Macs are not supported.
Memory	8 GB is comfortable for 2D and 2.5D work. Give it 16 GB if you rough large 3D models often.
Graphics	Any graphics card with OpenGL 2.1. The 3D view and the cutting simulation draw through it. Without it, drawing and 2D toolpaths still work and only the 3D preview is lost.
Internet	Needed to sign in, activate a computer, redeem a key and download updates. Once a computer is activated it runs without a connection.

The machines it writes programs for are 3-axis routers and mills: X, Y and Z, with the tool vertical. Parts can be cut from both sides by flipping the stock. Rotary axes, 4-axis and 5-axis work and lathes are outside what it does.

Creating your account

Start here. You need an account to download Carvect Pro, and the same account later holds your licence: it is what lets one licence work on your second computer, and it is where a purchase is recorded. Making one is free, needs no card, and starts you on the trial.

On the website

- 1 Go to carvect.com and choose **Sign in**, then **Create an account**, or go straight to carvect.com/register.

- 2 Enter your **Name**, **Email** and a **Password** of at least 8 characters.
- 3 Press **Start the trial**. You land on your account page, signed in.

In the application

If someone else downloaded the installer for you, you can make your account from inside the application instead.

- 1 Choose **Help ► Account & Licence...**, then **Sign in...**
- 2 Open the **Create account** tab.
- 3 Fill in Name, Email and Password and press **Create account**.

Either way, a new account starts on the free trial. If the email address is already registered you are told so; sign in instead.

Signing in, and a forgotten password

Sign in to the application from **Help ► Account & Licence... ► Sign in...**, using the **Sign in** tab. Pressing Enter in the Password box signs you in. When you sign in, the application immediately takes one of your licence's two computer places for this computer (see *Two computers per licence*, below).

If you have forgotten your password, use **Forgotten your password?** on the website's sign-in page. Enter your email and press **Send the link**. The email contains a link that works once and expires after an hour; it opens a page where you choose a new password and are signed in.

Downloading

Downloads come from **carvect.com/download**. Anyone can open that page, but downloading an installer needs the account you made in the previous step.

- 1 Go to carvect.com and choose **Download**.
- 2 If you are not signed in, sign in. (If you skipped the previous step, **Create an account to download** takes you there.)
- 3 Press **Download .exe** for Windows or **Download .dmg** for macOS. The version number is printed beside each button.

The Windows file is called `CarvectPro-<version>-setup.exe` and the macOS file `CarvectPro-<version>.dmg`.

Installing on Windows

- 1 Run the downloaded `.exe`.
- 2 If you are allowed to install for everyone on the computer, the installer offers that; otherwise it installs for your own user account. Either works.
- 3 Choose the folder. The default is `Program Files\Carvect Pro`.
- 4 On the options page, tick **Create a desktop shortcut** if you want one, and leave **Open .cvc project files with Carvect Pro** ticked so double-clicking a job opens it.
- 5 Press **Install**, and on the last page leave **Launch Carvect Pro** ticked to start it straight away.

The Start menu gets two entries, **Carvect Pro** and **Uninstall Carvect Pro**.

Installing on macOS

- 1 Open the downloaded `.dmg`. A window appears with the Carvect Pro icon and a shortcut to your Applications folder.
- 2 Drag Carvect Pro onto Applications.
- 3 Eject the disk image and open Carvect Pro from Applications or Launchpad.

The first time it opens

Carvect Pro opens on its **Home** page: a greeting, your recent files, your projects and a set of cards for the usual first jobs (set up your machine, choose a post-processor, load your cutters). Nothing needs to be done here before you start. Press **New Job** to go to the workspace, where the Setup stage and the Job Setup form are waiting.

You do not have to sign in to the application straight away. Until you do, it runs as the trial, which does everything except write G-code. Sign in with the account you downloaded with when you want to take up a licence (see *Getting the licence into the application*).

The trial

The trial is the whole application with one thing held back: writing G-code. You can draw, import, set up 3D models, make every kind of toolpath, run the simulation, print a job sheet and save your work. When you press **Export G-code...** you are told

that G-code is the one thing the trial keeps back, and offered **Buy a licence...** or **Not now**.

The trial does not expire and needs no card. Anything you make on it is saved in the ordinary way, so after you buy, the same job file exports without being redone.

The coloured badge at the right-hand end of the ribbon shows where you stand. It reads **Trial** in amber until a licence is active, and then **Licensed · Pro**. Click it to open the Account & Licence window.

Buying a licence

There is one product at one price. The licence is perpetual, it covers two computers at a time and any number of CNC machines, and it includes twelve months of updates.

- 1 Sign in on carvect.com. Your licence is attached to the account you are signed in with, so use the one you will sign in to the application with.
- 2 Go to **Pricing** and press **Buy Carvect Pro**. The checkout opens over the page with your email filled in.
- 3 The price is shown in your currency, before tax. Tax for your country is worked out and added in the checkout.
- 4 Pay. Payments are handled by Paddle, who also send the receipt.

When the payment goes through you arrive on a thank-you page. Your licence appears on your account within a minute or two, and we email you the licence key as well. If it has not arrived, look in your spam folder before anything else.

Getting the licence into the application

If the application is signed in to the account you bought with, it only has to ask the server.

- 1 Open **Help ► Account & Licence...** (or click the Trial badge).
- 2 Press **Check again**. The window reports "Up to date — Pro" and the badge changes to **Licensed · Pro**.

If you prefer to use the key from the email:

- 1 Open **Help ► Account & Licence....** If it says *Not signed in*, sign in first with the email you bought with. A key belongs to the account it was bought on, and a key typed into a different account is refused.
- 2 Press **Enter a licence key...** and paste the key from your receipt.
- 3 You see "Licence updated — thank you."



The Account & Licence window

This window is the one place in the application that deals with your licence. Open it from **Help ► Account & Licence...**, from **Settings ► Account ► Account & Licence...** on the ribbon, or by clicking the licence badge.

From top to bottom it shows:

- The plan (**Trial**, or **Pro**) and what that means.
- Who you are signed in as.
- On a licensed copy, the **Licence key**, masked because this window tends to end up in screenshots. **Show** reveals it and **Copy** puts it on the clipboard. Below it, the date your included updates run to.
- **Computers**: how many of your two places are in use, one row per computer, with a **Release** button on each.
- **This computer's id**, with a **Copy** button. You only need this for a computer without internet access.

The buttons along the bottom:

Buy a licence...	Trial only. Opens the pricing page in your browser.
Activate offline...	For a computer with no internet connection. See below.
Check again	Asks the server for your current licence. Use it after buying, or after freeing a computer place elsewhere.
Enter a licence key...	Redeem the key from your receipt email.
Sign in... / Sign out	Signing out returns this computer to the trial and removes its licence file, so a shared computer cannot go on exporting after you leave. It does not release the computer's place. Use Release for that.
Close	Closes the window and refreshes the badge.

Two computers per licence

A licence is installed on two computers at a time. A computer takes its place the first time it signs in with a licensed account. When both places are taken, a third computer that signs in stays on the trial and the window tells you why.

To move the licence to a new computer, free a place first. You can do that in two places:

- In the application, on the computer you are leaving: **Account & Licence ► Release** beside its row. Releasing the computer you are sitting at asks you to confirm, and deletes its local licence file.
- On the website, on your account page, under **Computers**: press **Free seat** beside the computer. This is the one to use when the old computer is dead or gone.

Then press **Check again** on the new computer.

Copying Carvect Pro's settings folder to the new computer, or bringing them across with a migration tool, does not bring the licence with it. The settings are locked to the computer they were made on, so the new computer starts signed out on the trial. Sign in there, and release the old computer if it still holds a place.

If a licence is activated on an unusually large number of different computers in a short time, further computers are held on the trial and the message asks you to write to support@smepoint.com. Replacing a computer now and then never runs into this.

A computer with no internet

A workshop computer that is never connected can still be licensed. It needs a licence file made for it, which you carry over on a USB stick.

- 1 On the offline computer, open **Help ► Account & Licence... ► Activate offline...** and note **This computer's id** (32 characters). **Copy** puts it on the clipboard if you can save it to a stick.
- 2 On any computer with internet access, sign in at carvect.com and open your account page.
- 3 Under **Activate a computer with no internet**, type the id into **Computer id**, give it a name such as "Bench PC", and press **Issue licence**.
- 4 On the page that follows, press **Download licence file**, or copy the text in the box. If you copy it by hand, take all of it including the two lines of dashes.
- 5 Back on the offline computer, in the **Activate offline** window, press **Load from a file...** and pick the file, or paste the text into the box.
- 6 Press **Activate**. You see "Licence accepted — this computer is licensed."

Issuing the file takes one of your two computer places, just as activating online does. The file does not expire and does not need the website to exist, so keep a copy somewhere safe. If you lose it, the **Licence file** button beside that computer on your account page issues it again without taking another place.

A licence file only works on the computer it was issued for. Paste one into a different computer and you are told it belongs to a different machine.

Your account page on carvect.com

Sign in on the website and choose **Account**. The page has these panels:

 Profile	Your name, email and the date you joined. Change your name and Change your password open small forms in place. On a bought licence, Email my licence key again re-sends the key to your address. Your email address is where keys, receipts and password resets go; to change it, write to support@smepoint.com from that address.
Licence	The plan, the masked key with a Copy button, whether the licence expires (it does not), the date updates run to, and how many computer places are in use.
Computers	Every activated computer with its date, a Licence file button and a Free seat button.
Activate a computer with no internet	See the section above.
Orders	View your orders lists every purchase. Each order has its own page with the licence key, what you paid, and an Invoice button that opens a printable invoice. Use your browser's Print command to save it as a PDF.
Downloads	The installer for each platform, as on the download page.

Updating

Choose **Help ► Check for Updates....** The window says which version you have and asks the server what is available.

- 1 Under **Choose a version to install** you see the newest release and the two before it, each with its date, size and release notes. The newest one you are entitled to is already selected. You can pick an older one; installing an earlier version is supported, which helps if a new release does not suit a job in progress.
- 2 Press **Download & Install**. The progress bar shows the download, and **Cancel download** stops it.
- 3 When the download finishes you are asked whether to open the installer. Press **Open**.
- 4 You are then asked whether to quit Carvect Pro so the installer can replace it. Press **Yes**. Anything unsaved is offered to you first.
- 5 On Windows, the installer replaces the old version in place. On macOS, drag Carvect Pro onto the Applications folder in the window that opens and choose **Replace**.

Updating keeps your projects, settings, machines, tools, post-processors and licence. On Windows the installer's last page before installing says so, and names the version being replaced.

Your licence includes twelve months of updates from the date you bought it. A release published after that is shown with the reason it is locked. The version you already have keeps working, and every version released inside your twelve months stays yours to install.

Where your own files and settings live

The application keeps its settings, libraries and logs outside the program folder, which is why updating and reinstalling leave them alone.

Windows

`%LOCALAPPDATA%\CadCam\` (the folders Config, Data, Logs and Cache).

macOS

`~/Library/Application Support/CadCam`, with logs in `~/Library/Logs/CadCam` and caches in `~/Library/Caches/CadCam`.

Your job files are wherever you save them. Projects default to a **Carvect Projects** folder inside Documents.

The workspace

The Home page, the ribbon and its four stages, the panels either side, the 2D and 3D views, projects and files, preferences and the built-in help.



The Home page

Home is what you see when the application starts, and the **Home** button at the left of the top toolbar brings it back at any time. Press it again to return to your work. The ribbon is hidden while Home is showing.

The left rail has the ways into a job: **New Job**, **Open...** and **New from Template** under Start, and **New Project...**, **Open Project...** and **Sample Jobs** under Projects. When a machine is active its name and travel are shown there with a **Change machine** button. **Back to design** appears when you have a job open to return to.

The main area lists your projects and your recent files. The recent list can be filtered by name or folder and shown as a list or as cards; a file that has been moved or deleted is tagged MISSING. Below that are cards for first-time setup (your machine, a post-processor, your cutters, a template, an imported drawing, your preferences) and links to the guides and downloads on carvect.com.

How the window is laid out

From the top down:

- 1 The toolbar.** Home, a New/Open menu, a Save menu, an Export menu (Export G-code (All)..., Export Selected..., Job Sheet / Report...), Undo and Redo. At the right-hand end, a readout shows what the application is doing ("Ready" when idle).
- 2 The ribbon.** The Stage button at its left end, the command groups for that stage, and the licence badge at the right.
- 3 The side bar for double-sided jobs.** Only on a double-sided job: **Side 1 (Front)** and **Side 2 (Back)** buttons, and **Show other side**, which draws the opposite face faintly and mirrored so you can line features up across the flip.
- 4 The workspace.** A column of panels on the left, the 2D and 3D views in the middle, a column of panels on the right.
- 5 The status bar.**



The ribbon and the four stages

The Stage button at the left end of the ribbon shows the current stage in capitals. Click it to choose another. There are four:



Setup

The machine, the job's stock, the tool and material libraries, and importing.



Design

Drawing, editing, arranging and measuring vectors, and placing 3D models.



Manufacture

Toolpaths, the simulation, the checks and G-code output.



Settings

View options, the colour theme, preferences, and your account.

A job normally moves through the first three in order. Choosing a stage changes the ribbon to that stage's commands, and also brings the most useful side panel forward: Setup shows the Job Setup form, Design shows Properties if the drawing has anything in it.

Each group on the ribbon has a heading. A heading with a ▾ after it opens a card of commands, arranged in small labelled sets. **Tool Database**, **Material Database**, **Select** and **Preferences** are single commands and act straight away.

Leaving the Design stage cancels whatever drawing tool was active. Leaving Manufacture closes any toolpath form you had open without saving it.

The menu bar

Every ribbon command is also in the menu bar, which suits keyboard users and anyone who remembers where things were: **File**, **Edit**, **Job**, **Design**, **Arrange**, **Toolpaths**, **Machine**, **Tools**, **View** and **Help**. On macOS, Preferences, About and Quit are in the Carvect Pro application menu as usual.

The Design and Arrange menus are greyed out until the job has been set up. A new job has no stock, and there is nothing to draw on until there is.



The side panels

The left column has four tabs down its edge:



Setup

The Job Setup form. See the Setup chapter.

Sheets

The sheets in the job, for double-sided work and layouts that span several boards.

Layers

The layers on the active sheet.

Profiles

The shipped library of 3D reliefs and 2D outlines.

The right column has six:

Toolpaths

The list of operations, with the simulation controls underneath when a preview is running.

Properties

The selected object's position, size and settings. Toolpath forms open here too.

Nesting

Settings for packing parts onto the sheet.

Tools

The tool library, for picking and checking bits.

Materials

The material library.

Transform

Orientation, scale and position for an imported 3D model.

Drag the edge of a column to make it wider; the width is remembered. The chevron (◀ or ▶) on a column's outer edge collapses it, and clicking any of its tabs opens it again. The maximize button at the top right of the views collapses both columns at once, and **Ctrl+Shift+M** (⌘⇧M on a Mac) does the same.



The 2D and 3D views

The centre has two tabs, **2D** and **3D**. The 2D view is where you draw and select. The 3D view shows the stock, any 3D models, and the toolpaths as lines at their real depths, and it is where the simulation plays.

In the 2D view, roll the mouse wheel to zoom about the pointer, and drag with the middle button to pan. **+** and **–** zoom too. **Home** or **0** fits the whole job into the window, as does View ► Reset 2D View (Ctrl+0). Rulers along the top and left edge show the job's units.

In the 3D view:

- Drag with the left button to orbit.
- Drag with the middle button, or hold Shift and drag with the right button, to pan.
- Drag with the right button to roll.
- Roll the wheel to zoom.
- Click a face of the navigation cube in the corner to look straight at that side, or press **Iso** for the three-quarter view.

The **Reset view** button beside the tabs frames the job in 2D or returns the 3D camera to its starting angle, whichever view is showing.

The status bar

The left end names the job, with a dot before the file name when there are unsaved changes, and the project it belongs to if it is in one. Beside it is the active machine. When the stock is bigger than the machine's travel this turns red and says by how much, for example "job exceeds travel (X 1300>1220 mm)", so a job too big for the bed is obvious long before you get to it.

The middle of the bar shows short messages: the result of the last command, and a one-line description of whatever the pointer is over. The version number is at the far right.



Projects

A project is a folder on your disk that holds a job and everything that goes with it. Carvect Pro marks it with a small file named `project.carvect` and creates three folders inside it: **Designs** for jobs and the drawings they come from, **Imports** for models, vectors and photographs as they arrived, and **G-code** for what goes to the machine. Because it is an ordinary folder, you can copy it, back it up, or open it in Finder or Explorer.

To make one, choose **File ► New Project...**, type a name, and pick where the folder should go. It starts in Documents, in a folder called Carvect Projects.

File ► Open Project... adds an existing project to your list. Pointed at a folder that holds several projects, it adds them all. Pointed at an ordinary folder of work, it asks whether to make it a project, which adds the project file and the three folders and moves nothing.

Projects are listed on the Home page. Click one to see its files. Clicking a job or drawing opens it, clicking a model or picture imports it into the current job, and anything else (G-code included) is shown in Finder or Explorer. **Rename...** changes the name shown for the project; the folder keeps its name on disk.

While the open job lives in a project, **Save As** starts in its Designs folder and **Export G-code** starts in its G-code folder.

File ► Create Sample Jobs... builds a project of worked examples: one job for each kind of toolpath, and three parts that use several operations together in the order a shop would run them. They are ordinary jobs. Open them, change them, cut them.



Opening and saving

A Carvect job is a `.cvc` file. It holds the whole job in one file: the drawing, the toolpaths, the tools used, the stock and the machine.

File ► New	An empty job, with no stock yet. Set up the job before drawing.
File ► New from Template...	A job with a template's stock, machine and staged operations already in place.
File ► Open...	Opens <code>.cvc</code> jobs, and also <code>.svg</code> and <code>.dxf</code> drawings, which open as a new job. A DXF is read as millimetres.
File ► Open Recent	The last few files you opened. The number kept is set in Preferences.
File ► Save / Save As...	Saves the job. A name typed without an extension is saved as <code>.cvc</code> . Save As can also write <code>.svg</code> or <code>.dxf</code> , which keeps the vectors on the active sheet and nothing else.

When you start a new job, open another, or quit with unsaved changes, you are asked whether to save them first.

Only one copy of the application runs at a time. Starting it again, or double-clicking a `.cvc` file, brings the running window forward and opens the file in it.

Autosave and crash recovery

While autosave is on (it is, unless you turn it off in Preferences), the open job is written to a recovery file every 60 seconds. A normal exit deletes that file. If the application did not close cleanly, the next time it starts it asks whether to restore your unsaved work. **Yes** loads it, marked as unsaved so you remember to save it properly; **No** discards it.



Preferences

Open Preferences from **File ► Preferences...** (on macOS it is in the Carvect Pro application menu), from **Settings ► Preferences** on the ribbon, or from Home.

Default units	Millimetres or inches, for new jobs.
Autosave	Turns crash recovery on or off.
Autosave interval	How often the recovery file is written, in seconds. The default is 60.
On exit	Whether to ask about unsaved changes when you close.
Context help	The hover cards on forms and the descriptions on buttons. Turn it off once you know your way around.
Feeds & speeds	Set feeds and speeds from the material fills a new operation's feed, plunge and spindle speed from the job's material and the chosen bit. The same switch is Machine ► Auto Feeds & Speeds .
Plunge rate	Keep the plunge rate within what the bit can take is the second tick box under Feeds & speeds. It lowers the plunge rate for thin bits in hard material. It only ever lowers it.
Recent files kept	1 to 50. The default is 10.
Undo history steps	How far back Undo goes. The default is 500, and 0 means unlimited.
Selection colour	The colour selected shapes are drawn in.

Changes take effect when you press OK.

The colour theme is set separately, under **Settings ► Theme**. There are eleven, from Paper (the default) and Studio Light to the darker Graphite, Carbon and Hybrid Dark, and the 2D and 3D views follow the theme. The grid, guidelines and Dynamic Input are switched in the **View** menu or under **Settings ► View**.

Help while you work

Hover over any ribbon button, menu item or form field and a card explains it: what it does, what changes if you alter it, and what zero means where zero is special.

The same short description appears in the status bar. Toolpath and setup forms also keep a larger card on the panel that follows the field under the pointer. On a job in inches, the measurements in the help are given in inches.

The Help menu holds **Account & Licence...**, **Check for Updates...**, **Open-Source Licences...** and **About Carvect Pro**. The Home page links to the guides and the full feature list on carvect.com.

Setup

The machine, the piece of stock, the cutters and the materials. Everything later in a job is measured from what is entered here, so it comes first.



Why setup comes first

Two things decide whether a correct drawing turns into a correct part. The **machine** decides how far the tool can travel, how fast it may move, and what form the G-code file takes. The **job** decides where zero is: every depth is measured from its Z zero and every position from its XY datum. Get either of them wrong and a perfect toolpath cuts in the wrong place, to the wrong depth, or not at all.

You can change the setup later. Toolpaths made before the change are then flagged as out of date, and **Manufacture ► Operations ► Recalculate All** rebuilds them.



Job Setup

Job Setup describes the material you are cutting, not the drawing. It is the **Setup** tab in the left-hand column, and it is shown whenever you choose the Setup stage. Fill in each card and press **Apply**. The application then moves you on to the Design stage.

A new job has no stock, and its width, height and thickness boxes are empty. Nothing can be drawn until the job has been applied with a size.

Machine	The machine this job will be cut on. Built-in machines are marked "(built-in)". It sets the travel the job is checked against, the feed limits, and the post-processor that writes the G-code.
Job Type	Single sided cuts from the top only. Double sided adds a second face, cut after the stock is turned over. See <i>Double-sided jobs</i> below.
Job Size	Width (X) , Height (Y) and Thickness (Z) of the stock, and Units (mm or inches). X and Y are the sheet as it lies on the bed, seen from above.
Z Zero Position	Material surface or Machine bed . This is where you will touch the tool off, and every cut depth is measured from it.

XY Datum Position

Which corner, or the centre, is X0 Y0. It is the point you jog the machine to before pressing start. **Use offset** moves the origin away from that point by the X and Y you type.

Modeling Resolution

How fine the grid behind 3D models and the simulation is, from **Draft (fastest)** through **Normal**, **High (3× slower)** and **Very High (7× slower)** to **Maximum (15× slower)**. It affects 3D work and the preview only. 2D vector cutting is exact at any setting.

Material

What the stock is (MDF, plywood, oak, maple, walnut, pine, acrylic, aluminium, brass or steel) and the **Colour** it is drawn in. The material is the starting point for feeds and speeds.

Measure the stock before typing its thickness. Sheet goods are rarely their nominal size, and a profile cut to 18 mm through a sheet that is really 17.5 mm leaves no skin while one cut to 18 through a sheet of 18.4 leaves the parts attached.

Front-left is the usual datum because it is the corner you can see and reach. Centre suits round or symmetrical work. Whatever you choose here has to match what you do at the machine.

Material surface is the common choice for Z zero. It copes with a sheet that is not quite its nominal thickness, because depths are measured from the face you actually touched off. Choose **Machine bed** when the thickness left under a pocket matters more than the depth from the top.

Changing the size later

You can reopen Job Setup at any time, change the size and press Apply again. The Job ► Job Setup... window also has **Scale existing drawing to fit the new job size**. Leave it off when the drawing is a real object at its true size, and turn it on when the drawing is artwork that should fill whatever stock you have.

The Job Setup Wizard

Job ► Job Setup Wizard... asks the same questions over four pages, one subject at a time. It produces the same result as the form.



Machines

A machine in Carvect Pro holds what the application needs to know about the real one: its travel on each axis, the post-processor that writes its files, and the limits of its spindle and feed. A few generic machines are built in. Setting up your own takes

a few minutes and pays for itself on the first job.

Open **Setup ► Machine ► Machine Library...** (also in the Machine menu, and the **Change machine** button on Home).

- 1 Select the built-in machine closest to yours and press **Duplicate**. Built-in machines cannot be edited or deleted, so you always work on a copy.
- 2 Give it a **Name**.
- 3 Under **Travel min** and **Travel max**, enter the travel on X, Y and Z. These are what the envelope check compares every job against.
- 4 Choose its **Post processor**. See *Post-processors* below.
- 5 Under **Spindle & feed**, enter **Max RPM**, **Min RPM**, **Max feed** and the machine's **Rigidity**. A value of 0 uses the default for that kind of machine. Automatic feeds never exceed these limits.
- 6 Tick **Automatic tool changer** only if the machine changes bits by itself. Without it, a job that uses more than one bit is exported as one file per bit.
- 7 Optionally choose a **Machine model (STL)** so the 3D view shows your machine.
- 8 Press **Save**, then **Set as active**.

The **Machine Builder — verify by jogging** panel moves a marker inside the machine's travel in the 3D view. Jog each axis in the + direction; if the marker moves the opposite way to your machine, flip that axis's **Direction** in the table. **Export...** and **Import...** move a machine between computers as a small file. **Reset Defaults** removes all your own machines and restores the built-in set, so use it with care.

To change the machine for the job in hand, use the **Machine** card in Job Setup or **Setup ► Machine ► Set Active Machine....** The status bar shows the active machine at all times.

The envelope check

Whenever the stock is larger than the machine's X or Y travel, the machine name in the status bar turns red and gives the axis and the numbers. When you export, the toolpaths themselves are checked against the travel on all three axes and you are warned about anything outside it. Both checks use the active machine, so they are only as good as the travel you entered.



Post-processors

The same toolpath has to be written differently for different controllers. A post-processor is the set of rules that does that. Each machine names the post it uses, and **Setup ► Machine ► Post Library...** is where the posts live. Four are built in.

As with machines, duplicate a built-in post to change it. The settings are:

Name, Key, Description	How the post is listed, the short id it is saved under, and a note about what it is for. Changing the key of a saved post breaks jobs that refer to it.
Units	Whether the file is written in millimetres or inches. This is what the machine expects, and it is independent of the units the job was drawn in.
Arcs (G2/G3)	Write curves as arc moves. Off, every curve is broken into short straight moves, which works on any controller.
Arc IJK absolute	Whether arc centres are given from the origin or from the start of the arc. If arcs come out as wild loops on a machine that otherwise runs fine, this is the setting to look at.
Line numbers	Number each line, with the start, step and wrap-around value (N start and the maximum).
XYZ dp	Decimal places for coordinates. Three is normal in millimetres, four in inches.
Comments	Whether operation and tool names are written into the file, and in which bracket style.
File ext	The extension exported files get.
Line ending	Windows (CRLF) or Unix (LF).
Modal motion	Leave out a motion word when it has not changed from the line before. Smaller files; turn it off if a file misbehaves part-way through.
Header, Footer, Tool change	The blocks written at the start, the end, and at each tool change. Header 1st toolchange says the header already loads and starts the first tool, so no separate tool change is written for it.

Preview... shows a sample program written with the settings as they stand. **Set as default** makes a post the one new machines use.

Before cutting anything with a new or edited post, export a short job and compare it with a file you know runs on that machine. The units line and the arc settings are the two that cause most trouble.



The Tool Database

Every toolpath is cut with a bit from the tool database. Open it with **Setup ► Tool Database**.

The bits are listed in a tree: **Milling** (end mills, ball nose, bull nose, V-bits, engraving, tapered mills, tapered ball, round-over and cove, surfacing), **Hole Making** (drills, centre drills, spot drills, reamers, counterbores, countersinks) and **Other**. A picture of the selected bit is drawn from its dimensions, and the dimension you are editing lights up on it.

Each bit has these groups of fields:

Identity	Name , Tool Type and Notes . The type decides which toolpaths accept the bit and how the simulation draws it.
Geometry	Diameter (D) , Shank Ø , Flute length , and where they apply the Included angle and Tip Ø of a V-bit or tapered bit, and the Corner (sharp, rounded or hollow) with its Corner radius .
Cutting Parameters	Pass depth (the most this bit should cut in one pass) and Stepover , as a percentage with the length worked out beside it.
Feeds and Speeds	Spindle speed , Feed rate and Plunge rate , with the resulting Chip load shown so you can check it against the maker's figures. The Material and Machine boxes above decide which set of numbers you are looking at, because the same bit runs at different speeds in MDF and in aluminium.
Tool Number & Vendor	The Tool number , Vendor and Part number , kept with the bit for your records and for reordering.

Use **Add**, **Duplicate** and **Delete** to manage the list and **Apply** to save your changes to a bit. Measure your bits. A cutter sold as 6 mm is often 5.95 mm, and on a fitted joint that difference shows.

To start with a full library, choose **Manufacture ► Tools ► Load Default Bits (Metric)** or **Load Default Bits (Imperial)**. The shipped sets hold 63 metric and 57 imperial bits covering the common shapes and sizes. The **Tools** tab in the right-hand

column has **Export...** and **Import...** buttons for moving a library between computers. Importing asks whether to **Merge** the file into your library or **Replace** it.



The Material Database

A bit has general-purpose numbers. What it should actually run at depends on what it is cutting, and that belongs to the material. **Setup ► Material Database** holds the materials.

A material has a **Name**, a **Kind**, the usual **Thickness**, **Width** and **Length** of the stock you buy, a **Colour** and **Notes**. Below those is a grid, **Cutting defaults, per tool type**: for each type of bit, and for a given bit diameter, the **Feed**, **Plunge**, **Spindle** speed, **Stepdown** and **Stepover**.

Load shipped materials adds a set of 21 woods, sheet goods, plastics and soft metals, with starting numbers for each. Edit them to suit your machine as you learn what it likes.

Automatic feeds and speeds

With **Machine ► Auto Feeds & Speeds** on (it is on by default, and the same switch is in Preferences), choosing a bit in a toolpath fills its feed, plunge and spindle speed from the job's material and that bit, and holds them within the active machine's limits. The numbers come from published chip-load figures. They are a starting point. Your machine's stiffness and the sharpness of the bit are not in the calculation, so listen to the cut and adjust.

A second setting, **Keep the plunge rate within what the bit can take**, lowers the plunge rate for small bits in hard material. It never raises anything.



Templates

A template saves the setup you use most: the stock you buy, the machine you own, the tools you reach for and the operations you always run. Starting a job from one skips the setup.

File ► New from Template... starts a job from a template. **Setup ► Machine ► Template Library...** manages them. Two are built in, a sign-making setup in MDF (mm) and a plywood cut-out setup in 3/4 inch sheet (inches).

To make your own, set a job up the way you like it and press **New from Current Job** in the Template Library. A template holds a **Name**, **Notes**, the **Machine** and **Post**, the **Job setup**, a list of **Default tools** and **Pre-staged operations**. **Set as default** marks the template you use most, and the library opens on it. **Apply to New Job** starts a job from it straight from the library.

Pre-staged operations wait under **Toolpaths ► Staged Operations** until you have drawn something for them to cut. Select the shapes and apply them from there, or clear the list if you do not need them this time.

Sheets

A job can hold more than one sheet: the two faces of a double-sided job, the boards of a sliced 3D model, or several boards in one layout. Each sheet has its own stock, its own drawing and its own toolpaths.

The **Sheets** tab in the left-hand column lists them. **+** adds a sheet, **–** removes the selected one, and **Rename** names it. Click a sheet to make it the active one. **Show all sheets in view** (also **View ► Show All Sheets**) draws every sheet at once so you can see how they relate.

Double-sided jobs

Some parts need cutting from both faces: a sign with a pocket on the back, a tray with feet, a carving finished on both sides. Choose **Double sided** under Job Type in Job Setup. Two more settings appear:

Flip Direction Between Sides	How you will turn the stock over: Flip left ↔ right (about the Y axis) or Flip top ↔ bottom (about the X axis) .
Zero off same side	Keep one Z zero for both sides, set on the same physical face. When it is on, you do not re-zero after the flip.

The bar above the views now shows **Side 1 (Front)** and **Side 2 (Back)**. Click one to work on that face. Each face has its own drawing and toolpaths. You draw Side 2 as you will see it once the stock is turned over, and **Show other side** draws the opposite face faintly, mirrored, so you can line features up through the board.

Export handles the mirroring. See *Exporting a double-sided job* in the Output chapter.

Changing a double-sided job back to single sided asks which side to keep, and deletes the other side's drawing and toolpaths.



Nesting

Nesting packs parts onto the sheet to waste as little as possible. Select the parts and choose **Arrange ► Nest Parts...** or **Manufacture ► Output ► Nest Parts....** The Nesting tab in the right-hand column holds the same settings.

Tool Dia. (D)	The bit the parts will be cut out with. Parts are kept at least this far apart so the cutter fits between them. Set it to the largest bit any profile uses.
Clearance (C)	Extra space between parts on top of the tool diameter.
Border Gap	How far parts stay from the edge of the sheet. Leave room for clamps.
Rotate parts to find best fit	Allow parts to be turned, in steps of the Rotation step angle . Turn it off for material with a grain or a printed face.
Mirror parts to find best fit	Allow parts to be flipped over. Only safe when the two faces of the part are the same.
Allow parts inside other parts	Let small parts sit in the holes of larger ones.
Nest two-sided parts	Keep a double-sided part's two faces aligned when it is moved.
Remove original parts	Delete the parts from their old places once they are nested. Leave it off on a first try so you can compare.
Sheet Options	The corner packing starts from, and whether rows fill Along X or Along Y .
Use bounds layer	Nest inside a shape you have drawn on a layer instead of the whole sheet, to avoid a damaged area, a knot or a clamp.
Copies	How many of each part to place.

Press **Preview** to see the layout and the utilisation figure, and **Reset Preview** to try again. Nesting packs by each part's bounding box. Toolpaths already made from the parts need recalculating after they move.

Design

Drawing and importing the shapes the toolpaths will follow, and editing, arranging and checking them.



Vectors, open and closed

Everything you draw or import is a vector: lines, arcs and curves joined end to end. A vector whose ends meet is **closed** and encloses an area. One whose ends do not meet is **open**.

The difference matters when you make toolpaths. A pocket, a V-carve or an inlay needs a closed shape, because it clears or carves an area. A profile runs around a closed shape to cut it out. An engraving or a fluting follows the line itself and is happy with open vectors. If a toolpath comes out empty or strange, **Design ► Modify ► Highlight Open Vectors** is the first thing to try: it marks every shape whose ends do not meet.

Drawings imported from other programs often look closed and are not, by a fraction of a millimetre. **Weld / Close Gaps...** repairs that.



Selecting

Choose **Design ► Select**, or press Esc to put down whatever drawing tool you are holding.

- Click on a shape's line, or inside a closed shape, to select it.
- Hold Shift and click to add shapes to the selection or take them out.
- Drag across empty space to select everything the box touches.
- **Ctrl+A** (⌘A) selects everything.

A selected shape shows handles. Drag a corner handle to scale in proportion, an edge handle to stretch in one direction, the centre to move it, and the curved arrows at the corners to rotate. Right-click for a menu of the common edits.

The status bar gives the selection's perimeter and area. The **Properties** tab shows its exact position and size, which you can type into.

Selecting areas instead of shapes

Where shapes overlap, you may want to machine one of the pieces they make rather than a whole shape: the part of a rectangle that a circle does not cover, for instance. Turn on **View ► Select Areas** and click inside the area you want. Shift-click adds more areas, and clicking empty space clears them. The drawing itself is not changed. Toolpaths that work on areas offer this in their **Vectors** card.



Drawing tools

The drawing tools are under **Design ► Draw**, and in the Design menu. Each has a single-letter shortcut.



Line (L)

Click the start and click the end, or drag from one to the other. Each pair of clicks makes one separate line.



Polyline (P)

A run of connected straight segments. Click each point, and double-click or press Enter to finish. A polyline is left open; to close it, use **Join Vectors** or **Close by Extending Ends**.



Rectangle (R)

Drag from one corner to the opposite corner.



Circle (C)

Click the centre, then drag or click out to the radius.



Arc (3-pt) (A)

Click three points the arc passes through. Use it when you know where the curve must go.



Arc (centre) (D)

Click the centre, then the start of the arc, then its end.



Bézier (B)

A smooth curve you shape by dragging its control handles.



Text (T)

Click where the text should go. See *Text* below.

Press Esc to abandon the shape you are drawing. The tool stays active so you can draw another; choose Select to put it down.

There are no polygon or star tools. The **Profiles** tab has a library of ready-made 2D outlines, stars, polygons and frames among them, that can be dropped onto the job and sized.

Snapping

As you move the pointer near an existing shape, its end points, midpoints and centres are marked, and the pointer snaps to them. It also snaps to the corners and edges of the job and to the grid (10 mm). **View ► Show Grid** shows or hides the grid.

Typing exact sizes

With **Dynamic Input** on (**View ► Dynamic Input**, or F12), a box follows the pointer while you draw and you can type the size: length and angle for a line, width and height for a rectangle, radius for a circle. Press Enter to accept. The setting is remembered.

For a shape at an exact position, use **Draw Line (exact)...**, **Draw Circle (exact)...** or **Draw Rectangle (exact)...** Each opens a small form: a line's start point, length and angle; a circle's centre with its radius or diameter; a rectangle's corner, width and height.

ABC

Text

Choose **Text (T)**, click where it should start, and fill in the form: the **Text**, the **Font** (any font installed on the computer), the **Style** and the **Height**. To set the text along a curve, select a single open vector first (a line, arc, polyline or curve) and tick **Lay out on selected vector**.

Text stays editable until you convert it. V-carving and engraving work on its outlines either way. **Convert Text to Curves** turns it into ordinary vectors that no longer depend on the font. Do it before sending the job to a computer that may not have the font, and before editing individual letters.



Fillets and offsets

Fillet / Dog-bone... changes corners. Choose **Fillet (round corners)** to round them to a radius, or **Dog-bone (corner relief)** to cut a small notch into each inside corner. A round cutter cannot make a square inside corner, so a square peg will not seat in a milled pocket; the dog-bone notch gives its corner somewhere to go. Apply it to **All corners of the selection**, or choose **Pick corners on the canvas** and click the ones you want.

Offset Vector... makes a parallel copy of a shape at a set **Distance**, **Outward (grow)** or **Inward (shrink)**, with corners kept **Sharp** or **Rounded**. It changes the drawing, and the result can be machined or offset again. A profile toolpath's offset is separate and leaves the drawing alone.



Moving, turning and sizing

All under **Design ► Modify ► Transform**:



Move...

Shift the selection by an exact X and Y.



Rotate...

Turn the selection by an angle (counter-clockwise is positive), about its own centre or a pivot point you type.



Scale in 2D...

Resize by a factor, or to an exact width and height, with **Scale proportionally** to keep the aspect. It scales X and Y only; a 3D model scaled this way keeps its height. To resize a model in all three axes use its Transform settings.



Resize to Fit Job

Scale the selection by one factor to the largest size that fits the stock, and centre it. With nothing selected it offers to fit the whole drawing. This is the usual first step after importing artwork.



Flip Horizontal / Flip Vertical

Mirror the selection about its own centre.



Mirror Across Line...

Pick a line in the drawing and a mirrored copy of the selection is made on the other side of it.

Duplicate (Ctrl+D) makes a copy offset slightly from the original, and **Delete Selection** removes it. Toolpaths made from a deleted shape are flagged out of date rather than silently removed.



Editing vectors

Under **Design ► Modify ► Edit Vectors**:



Weld / Close Gaps...

Join the ends of open vectors that are within a distance you set (0.1 mm to start with). The repair for imported artwork.

	Trim Vectors	Cut a vector back to where another crosses it.
	Join Vectors	Chain open vectors whose ends meet into one continuous, closed vector.
	Break Apart	Split a vector into its separate segments.
	Convert Text to Curves	Turn text into ordinary vectors.
	Set up Inlay (Plug + Pocket)	Prepares a selected design for an inlay: see the Inlay toolpath.
	Vector Clipper	Click a stretch of line between two crossings to delete just that stretch. Useful for tidying overlapping artwork.
	Boundary Around...	A new closed outline around the selection at an offset (5 mm to start with). Convex wrap (simple) stretches round it like a rubber band; Hug tightly (save material) follows its shape.
	Highlight Open Vectors	Mark every vector whose ends do not meet.
	Extend to Intersection	Run an open vector's end on until it meets another.
	Close by Extending Ends	Close an open vector by extending its two end segments until they meet.

Combining shapes

Design ► Combine Shapes changes the drawing itself:

Union (weld into one)	Merge overlapping shapes into one outline.
Subtract (cut the others out)	Cut the other shapes out of the boundary shape.
Intersect (keep the overlap)	Keep only where the shapes overlap.

When you only want a toolpath to treat overlapping shapes a certain way, you do not need to change the drawing. The toolpath's **Overlapping vectors** setting and Select Areas both work without editing it.



Grouping, arrays and alignment

Under **Design ► Arrange**:



Group / Ungroup

Bind shapes so they move, turn and scale together (Ctrl+G), and split them again (Ctrl+Shift+G).



Array...

Repeat the selection. **Linear** places a row of copies at a set spacing and direction, or spread along a total length. **Circular** places them round a centre, which you can type or pick on the drawing, over a total angle.



Align to Job

Left, Right, Centre H, Top, Bottom, Middle V or Centre, against the edges of the stock.



Align to Selection

The same seven, against each other.



Assign to Layer...

Move the selection onto another layer.



Measuring

Design ► Inspect has three tools. Measurements are notes on the screen and are never machined.



Measure Distance

Click two points. It snaps to end points, midpoints and centres.



Measure Angle

Click to set out two directions and read the angle between them.



Measure Arc

Click where a span of an arc or circle starts, sweep round, and click where it ends. You get the included angle, the length along the curve, and the radius, diameter and centre of the circle it lies on.

✕ Hide measurement clears the result from the view.



Layers

Each sheet has layers, listed in the **Layers** tab on the left. Buttons along the top add, delete, move up, move down and rename layers. On each row you can change the colour, show or hide the layer, and lock it so its shapes cannot be selected.

Layers are more than tidiness. Hidden and locked layers are left out of Resize to Fit Job, area picking only sees what is shown, and nesting can use a layer as its boundary. Putting the parts, the cut-outs and the reference artwork on separate layers pays off later in a job.

The Properties tab

With a shape selected, the **Properties** tab on the right shows its position and size, and the fields that belong to its kind: the ends of a line, the centre and radius of an arc, the text and font of a text object. Type a value and press Enter to change it.



Importing drawings and pictures

The import commands are on the **Import** card of both the Setup and Design stages, and in the File menu.



Import SVG...

Brings the artwork in as editable vectors, at its true size, centred on the stock. If it arrives at the wrong size, check the units the drawing was saved with; **Resize to Fit Job** will fit it to the stock.

DXF

Open a DXF with **File ► Open....** It opens as a new job, and its dimensions are read as millimetres.



Import Image...

Places a picture (PNG, JPEG, BMP, GIF or TIFF) on its own layer, sized to about nine-tenths of the stock. Use it to trace over by hand, or as the source for a Photo V-Carve or Sketch Carving.



Import 3D Model (STL)...

See the 3D models chapter.

Trace Image to SVG

Trace Image to SVG... turns a picture into vectors. It works best on clean, high-contrast artwork such as a logo or a line drawing; a photograph traces into a mass of contours.

- 1 Choose the picture.
- 2 Under **Pick up as vectors**, choose **By shade** to split the picture into light and dark, or **By colour** to pick out one colour you click on.
- 3 For shade, move the **Shade threshold** until the highlight covers the shapes you want and nothing else. **Pick lighter side** traces the light areas instead of the dark ones, which is what white lettering on a dark background needs. For colour, click the picture to set the **Target colour** and adjust the **Colour tolerance**.
- 4 Set **Smoothness / simplify**: raise it until the outline starts to lose detail, then come back a step. **Round corners** suits organic artwork; turn it off for lettering and anything with real corners.
- 5 Raise **Ignore specks smaller than** a little to throw away scanner dust and JPEG speckle, each of which would otherwise become a tiny shape and a plunge.
- 6 Leave **Also add vectors to the design** on to put the result straight into the drawing, and save the SVG.



The Profiles library

The **Profiles** tab on the left holds a library of ready-made ornaments, grouped by kind and searchable with the **Filter** box. There are two sorts in the one list: 3D **reliefs** (domes, petals, mouldings and the like) that the 3D toolpaths carve, and 2D **outlines** that any 2D toolpath can follow. The tooltip on each says which it is.

Double-click an item, press **Place on job**, or drag it onto the drawing to put it where you drop it. Reliefs go on a layer called "3D Profiles" and outlines on "2D Profiles". A placed relief can be moved, resized and made to stand more or less proud with the Transform settings. **Save as SVG...** writes an outline out as a file.

3D models

Bringing in an STL model, turning it face up, sizing it, deciding how deep it sits in the stock, and slicing a model too tall to cut in one piece.



How Carvect Pro carves a model

A 3-axis machine can only reach a surface from above. So Carvect Pro treats a 3D model as a surface seen from the top: at each point, the highest part of the model is what gets cut, and anything underneath an overhang is left solid. Choosing which face points up is therefore the first decision, and the most important one.

The 3D toolpaths (see the Toolpaths chapter) then rough the bulk away and finish the surface. The fineness of the grid the model is sampled on is the **Modeling Resolution** in Job Setup.



Importing a model

- 1 Set up the job first, with the real thickness of the stock you will carve.
- 2 Choose **Design ► 3D Model ► Import 3D Model (STL)...** (it is also on both Import cards and in the File menu) and pick an `.stl` file.
- 3 The **Transform** tab opens on the right and the model appears in the 3D view, live, as you change the settings. Nothing is added to the job yet.
- 4 Set it up as described below, then press **Position & Import**.

A very dense mesh is simplified as it comes in, to about the precision the machine can cut, and the status bar says so. A model clicked in a project's file list is imported the same way.



Face up, rotation, size and position

The Transform tab has these settings:

Face up	Which face of the model points at the cutter: Top (as modelled) , Bottom (flip over) , or the Front , Back , Left or Right face. Choose the one that shows the detail you want to carve.
Rotate X, Y, Z	Fine rotation about each axis, in degrees. Rotate Z presets turn it in quarter turns on the bed.
Scale X, Y, Z	Scale factors. With Uniform ticked the three stay locked together.
Size X, Y, Z	The same thing expressed as finished dimensions. Type the size you want and the scale follows.
Position X, Y, Z	Where the model sits on the stock.

In the 3D view the model also has a handle you can drag to move it.

To come back to these settings after importing, select the model and choose **3D Model ► 3D Model Orientation...**, which reopens the Transform tab for it. Its **Orientation & Size** settings also appear in Properties when the model is selected. Remember that **Scale in 2D** only changes X and Y: use the model's own size fields to scale all three axes together.



Model position and the Z plane

A model rarely has exactly the height of the stock. **3D Model ► Model Position & Z-Plane...** sets how the two fit together. It shows five numbers, and the three distances always add up to the stock thickness:

Stock thickness	From Job Setup, shown for reference.
Model height	How tall the model is once scaled. Changing it scales the height only and leaves the footprint as it is. This is the depth of relief you will carve, so it affects carving time more than anything else here.

Gap (model top → stock top)	Material left above the model's highest point. A small gap gives the finishing pass somewhere to start and hides a board that is not quite flat. Zero puts the model's peak at the surface.
Carve height (plane → model top)	How much of the model is above the Z plane. Only this part is carved.
Floor (stock bottom → Z plane)	Material left below the plane, which comes out as a flat floor.

If the model is deeper than the stock, raise the Z plane. The lowest part of the model is cut off and the rest keeps its detail. When the model is still deeper than the machine can reach, the 3D toolpath forms warn you.

The Properties tab shows the result as a sentence ("Carving 12.5 of the model", "The bottom 3 is left as the floor"), which is a quick check that the numbers mean what you think.



Reducing a mesh

A model with a million triangles slows every calculation and the preview, and most carvings do not need that much. Select the model and choose **3D Model ► Reduce Mesh....** You are told how many triangles it has and asked what percentage to keep. A quarter is a sensible first try. Recalculate any 3D toolpaths afterwards.



Slicing a tall model

Some models are too tall to carve in one piece: taller than the machine's Z travel, longer than the cutter's flutes, or thicker than any board you can buy. **3D Model ► Slice Model...** cuts the model into horizontal layers. Each layer is carved from its own board and the boards are glued back into the whole.

Slice thickness	The thickness of each slice, set to the boards you actually have. The model's height rarely divides evenly, so one slice comes out thinner.
Measure from the top	On, slices are measured down from the top and the odd thin slice is at the bottom. Off, it is at the top. Put it where the model has least detail.

Number of equal slices	The other way to divide it: say how many slices and the thickness is worked out.
Slice heights	Every slice, bottom first. Select one to move its top, add a cut, or delete one to merge two. You can drag a cutting plane in the section view, or double-click to add one. Use this to keep a glue line from running through a fine detail.
Boundary vector round each slice	Draws the outline of the material in each slice on that slice's sheet. Profile around it to free the layer.
Skin under each slice	Extra thickness added to each board (1 mm to start with). Profile the boundary to the slice's own thickness and the skin holds the layer in place while it is cut, with no tabs to leave stubs on the glue face. Plane or sand the skin off afterwards and the glue face is true.
Where the slices go	A sheet each gives every slice its own sheet with its own stock thickness, which is the usual choice. Alternatively they can be laid out side by side on the current sheet.

The form warns you when a slice is thicker than the active machine can cut, and lets you carry on in case the job is meant for a different machine.

The original model stays in the job on a sheet called "Source model", so a job cut into three slices has four sheets. Keep it as a reference or delete it. Nothing registers the slices for you when gluing, so glue from the bottom up and line each layer up on its outline.

Reliefs from the Profiles library

The **Profiles** tab includes a library of 3D reliefs (domes, petals, mouldings and more) that need no STL file. Drag one onto the drawing, or double-click it. It lands on the "3D Profiles" layer. Select it to change its position, its size and how far it stands proud in the Transform settings, then cut it with the 3D toolpaths like any other model.



Looking at a model in 3D

Switch to the **3D** tab. Orbit with the left mouse button, pan with the middle button (or Shift and the right button), roll with the right button and zoom with the wheel. The navigation cube in the corner turns the view to a face with one click, and **Iso**

gives a three-quarter view. **View ► Show 3D Models** hides and shows the models, which helps when you want to look at the toolpaths on their own.

Toolpaths

How a toolpath is made, the settings every one shares, each 2D, carving and 3D strategy in turn, and managing the list of operations.



Making a toolpath

- 1 Choose the **Manufacture** stage.
- 2 In the drawing, select the shapes to cut. (Surfacing, the photo carves and the 3D strategies work from the stock, a picture or a model and need less selecting; each section below says what it wants.)
- 3 Pick the strategy from **2D Toolpaths** or **3D Toolpaths** on the ribbon, or from the Toolpaths menu.
- 4 The form opens in the **Properties** tab on the right. Choose the **Tool bit**, then work down the cards.
- 5 Press **OK**. The toolpath is calculated, drawn over the job, and added to the list in the **Toolpaths** tab. **Cancel** closes the form without making anything.

To change a toolpath later, double-click it in the list (or right-click and choose **Edit...**), change what you need, and press OK again.



The tool bit

The **Tool bit** list shows the bits from the Tool Database whose shape suits the strategy: V-bits for a V-carve, flat and ball bits for a pocket, drills for drilling. Tick **Show all tool bits** to list the rest of the library as well. The small database button beside the list opens the Tool Database.

Once a bit is chosen, the fields it owns (its diameter, flutes and angle) are taken from the database and hidden from the form. The feed, plunge and spindle speed are filled from the job's material if automatic feeds are on, and from the bit if not. You can still change them for this operation.

Settings most toolpaths share

Name	What the operation is called in the list and in the G-code. Leave it and a name is made from the strategy. "Rough pocket 6 mm" is easier to find later than "Pocket 4".
-------------	---

Feed rate, Plunge rate, Spindle speed	How fast the bit moves while cutting, how fast it moves straight down, and how fast it turns. A spindle speed of 0 leaves the speed out of the file.
Cut depth	The total depth of the cut, measured down from the start depth. To cut a part free, go a few tenths past the stock thickness.
Start depth	How far below the top of the stock the operation begins. Use it when an earlier operation has already removed material, so the bit does not cut air on the way down.
Depth per pass	How much deeper each pass goes. 0 cuts the full depth in one pass. More than about half the bit's diameter per pass is heavy going in hardwood.
Passes	Force an exact number of passes. 0 lets the depth per pass decide.
Last pass depth	Make the final pass a light one of this depth; the passes above share the rest.

Depths are measured from the Z zero you set in Job Setup.

The Vectors card

Toolpaths that work from closed shapes have a **Vectors** card:

Machine / Follow	Vectors uses the shapes you selected. Areas uses the areas you picked with Select Areas.
Overlapping vectors	How several selected closed shapes combine. Keep separate is normal: a shape inside another is an island, and shapes that only overlap stay separate. Subtract the others from the boundary, Weld them into one shape and Only where they overlap combine them for this toolpath without changing the drawing.
Boundary vector	Which shape is the one being cut into, when the combine rule needs to know. Left alone it is the largest selected shape.

Rest machining

Rest machining (skip stock earlier toolpaths already cleared) makes a toolpath cut only what earlier operations left behind. It is what makes a large bit followed by a small one efficient: the small bit spends its time in the corners the large one could not reach instead of cutting air. It is not available on the first operation in a job.

Entries, ramps and allowances

Where a strategy has an **Entry** setting, **Ramp** or **Helix** takes the bit down while it moves, which is kinder to it than a straight **Plunge**. The ramp distance sets how far it travels on the way down. An **allowance** leaves material on the walls (a positive value) for a finishing pass or sanding, or cuts past the line (a negative value) to make up for a bit that measures small.



Profile

Cuts around a shape's outline: the operation that frees a part from the sheet or opens a hole. Select closed shapes (or open ones, for a cut on the line).

Side / offset	Outside for a part, so it keeps its drawn size. Inside for a hole. On line centres the bit on the line, cutting a slot one bit wide.
Direction	Climb usually leaves the cleaner edge. Conventional is safer on a machine with play in its drives.
Allowance offset	Material left on (positive) or cut past (negative) the line.
Separate last pass	Do a separate finishing pass leaves a thin skin (the Finishing allowance , 0.5 mm to start) and takes it off in one light pass at the end, which squares up a wall the roughing passes pushed out of true. Reverse finishing direction runs that pass the other way round.
Tabs	Add evenly-spaced tabs leaves small bridges holding the part to the sheet so the cutter does not throw it. Set the Tabs (count) , Tab length and Tab thickness . You can also place tabs by hand by clicking on the outline; put them on straight edges, where they are easy to clean up.
Entry	Ramp length takes the bit down along the cut. 0 plunges.

For a through cut, set the cut depth slightly past the stock thickness. Cutting exactly to thickness usually leaves a skin, because neither the sheet nor the spoilboard is perfectly flat.



Pocket

Clears all the material inside a closed shape to a depth. A shape fully inside another is left standing as an island.

Stepover	How far the bit steps sideways between passes, as a fraction of its diameter. 0.4 is a normal clearing cut.
Clearing pattern	Offset (concentric) follows the walls. Raster (zig-zag) is quicker in open areas. Spiral (continuous) joins the offset loops into one path so the bit enters once and never steps into solid material twice in the same place; on a pocket with an island it falls back to offset by itself.
Cut direction, Raster angle	Climb or conventional, and the direction of the raster lines (0 runs along X).
Profile pass	A final loop round the wall, Last (after clearing) or First (before clearing) . It cleans off the scallops the clearing leaves. Choose First for thin walls that might break out.
Entry	Helix (spiral bore-in) or Plunge (straight down) , with the ramp distance.
Pocket allowance	Material to leave on the walls.



2D Adaptive Clearing

Clears a pocket with a cut that holds the load on the bit constant, so it is never buried in a corner. The bit takes a deep, narrow cut, which spreads wear along the flutes and lets the feed go up.

Optimal load	How much of the bit's diameter is in the material at any moment. It is a different quantity from a pocket's stepover: 0.1 to 0.2 is normal here and is not slow.
Depth per pass	Because the load is controlled, this can be most of the flute length.
Wall taper	Lean the walls by an angle. 0 is straight.
Finish allowance	Material left for a finishing pass.

Trochoidal corner loops	Loop through inside corners instead of turning into them, with the Loop radius as a multiple of the stepover.
--------------------------------	--

Entry	Ramp or plunge.
--------------	-----------------



Trochoidal Clearing

Clears a closed shape with the bit cutting in light half-circle loops, each one taking only a sliver. On an open line it cuts a slot. The walls are cut first, the loops shrink to fit every corner, and the bit never crosses the shape's edge.

Loop width	The width of each loop. 0 picks one from the bit (1.8 times its diameter).
-------------------	--

Radial engagement	How far the cutter advances on each loop, as a fraction of its diameter. 0.05 to 0.15 is usual. Above about 0.25 there is little point cutting this way.
--------------------------	--

Direction	Climb or conventional.
------------------	------------------------

Cut full depth in one pass	Ignore the depth per pass and loop at full depth.
-----------------------------------	---



Surface

Skims a face flat with a wide bit: flattening a spoilboard or truing rough stock before the real work.

Face	Whole job stock , or Selected area for a shape you have selected.
-------------	---

Overhang past edge	How far the bit runs past the edge. Running out into free air avoids a mark at the boundary. Half the bit's diameter is a good start.
---------------------------	---

Pattern	Raster (parallel) or Offset (concentric) .
----------------	--

Stepover, Raster angle, Cut direction	As for a pocket. Along the grain leaves the better finish on wood.
--	--

Zig-zag	Cut in both directions. Off returns to the same side each pass.
----------------	---



Chamfer

Runs a V-bit along an edge to bevel it. Select the outline.

Width W	How wide the bevel is, measured across. The depth follows from the bit's angle: a 90° bit cutting 3 mm wide goes 3 mm deep.
Overcut	Extra depth below the bevel so it meets the face below cleanly.
Side	Outside bevels the outer edge of a part, Inside the rim of a hole or pocket.
Slope	Slope downwards or Slope upwards .
Cut direction	Climb or conventional.



Round Over

Softens an edge to a radius with a round-over bit. There is no radius to type: the bit cuts its own.

Shoulder / flat above	A flat lip left above the curve. 0 runs the round right up to the face.
Overcut	Extra depth below the curve.
Side	Outside edge , or Inside edge (hole or pocket) .
Cut direction	Climb or conventional.



Fluting

Cuts decorative grooves along lines, usually with a ball-nose or round-nose bit, easing in and out at the ends.

Flute depth, Depth per pass	How deep the groove is, and in how many steps. Alternate direction each pass saves travel.
------------------------------------	---

Flute width	0 makes the groove one bit wide. Wider grooves are cut in several side passes, their Cross-section either Flat bottom or Coved / scalloped , with a Side-pass stepover .
Ramp ends	Ramp both ends , Ramp at start , Ramp at end or No ramp (constant depth) , with a Ramp shape of Smooth (cosine) or Linear .
Ramp length / Ramp (% of length)	A fixed ramp length, or 0 to use a percentage of each flute (25% to start).



Drill

Drills a hole at the centre of each selected circle or point.

Cut depth	The hole depth. For a through hole, add a little for the drill's point.
Depth per pass	The peck: how far to drill before coming out to clear chips. 0 drills in one plunge. Set it for any hole deeper than about two diameters.
Retract	Where the drill lifts to between pecks: Retract above start depth , Retract above previous pass (with a Retract gap), or Retract to safe Z .
Deep-hole (advanced)	A different First peck , a Peck reduction so each peck is shorter than the last, and a Minimum peck .
Dwell at bottom	Pause at full depth, in seconds.
Breakthrough / overshoot	How far past the far face to go, so the hole is fully open.
Use vector selection order	Drill in the order you clicked the circles instead of the shortest route.



Engrave

Follows lines with the bit, cutting along them. The cut is centred on the line, so open vectors are fine: lettering, layout marks, decorative line work. Set the depth and passes; there is nothing else to decide.



V-Carve

Carves with a V-bit so the cut widens as it deepens. The carve goes deep where the shape is wide and shallow where it is narrow, which gives lettering its chiselled look. Select closed shapes: letters converted to curves, or any artwork.

Use flat depth / Flat depth	Stop carving at this depth and give wide areas a flat floor instead of letting them run to a point.
Carving pass step	How closely the carving passes are spaced. Smaller is smoother and slower.
Area clearance	With a flat depth, a flat bit clears the floor first. Choose the clearance bits, the Clearance stepover , Clearance depth/pass , Clearance pattern and direction, whether to ramp in, and whether the Clearance area is Flat areas only or the Whole pocket . Rough with clearance tool first takes the bulk out before the V-bit runs, which saves the V-bit's tip. Corner sharpen drives into inside corners to leave them as square as the tool allows.
Use vector start points	Start each cut at the shape's own start point, so the entry mark goes where you want it.

The depth of a V-carve comes from the shape and the bit's angle. To limit it, use the flat depth.



Inlay

Makes a matching pocket and plug so one piece of wood can be set into another. One operation cuts both halves: the pocket into the board the design is drawn on, and a mirrored plug onto a board of its own. Run it from the pocket's board. **Design ► Modify ► Set up Inlay (Plug + Pocket)** prepares a selected design for it.

Joint	V wedge cuts angled walls with a V-bit. The plug wedges tight as it seats, with no gap at the sides, and corners are as sharp as the bit's point. Straight wall cuts vertical walls with an end mill. It is quicker, but the plug has to be made smaller than the pocket, leaving a visible glue line, and inside corners take the bit's radius.
Fit clearance per side	How much smaller the plug is than the pocket on each side, so it goes in. A tenth or two suits most timber.

Generate	Pocket + plug, Pocket only or Plug only .
Pocket depth Dp	How deep the pocket is.
Plug surface gap Sp	How far the plug's face sits below the face of its own board. It lets the finished inlay stand proud, to be sanded flush when the glue is dry.
Plug wall height Fp	How tall the plug's wall is. Set it a little under the pocket depth so there is room for glue at the bottom.
Wall pass step, Wall step override, Floor clearance step	How finely the walls and floor are cut. Finer on the walls gives a better fit.
Plug outer boundary	Clear the plug's surroundings across The whole board (job stock) or only A moat around the design of a set Moat width . A moat must be wider than the bit.

A separate clearing bit can be chosen to take out the floor. If you later want the plug cut differently, **Toolpaths ► Regenerate Plug Only** re-cuts it from the pocket as it stands, so the two halves cannot drift apart.



Photo V-Carve

Carves a picture as grooves whose width follows the picture's brightness, like a halftone. Import the picture first (Import Image...). High-contrast images with a clear subject work best.

Max carving depth	A limit on how deep the grooves go.
Stepover retract	How far the bit lifts when it moves to the next line.
Pattern	Raster (parallel lines) , Hatch (crossed) (a second set at right angles, which darkens the shadows and doubles the time), or Selected vectors to follow lines you drew.
Line spacing	The distance between lines. Closer lines give a finer, shallower picture. On a V-bit the spacing also caps the depth, since a groove cannot be wider than the gap between lines.

Sample step, Line angle, Min cut depth	How finely the picture is read along each line, the direction of the lines, and a depth below which nothing is cut.
Invert (light cuts deep)	Swap the tones, so the light parts of the picture are cut deepest.



Sketch Carving

Carves a drawing or scan as fine lines, like an engraved plate. Import the picture first.

Line thickness	How heavily lines are cut, from 0 to 100. On a V-bit heavier means deeper and wider.
Trace light lines on dark	For a chalk-on-blackboard image. Off follows dark lines on a light background.
Use flat depth / Flat depth, Carving pass step	As for a V-carve.



Prism

Raises a shape as a faceted roof: a cone from a circle, a pyramid from a square, a ridge from anything longer than it is wide. It is a V-carve turned inside out: the surface rises from the edge at the bit's flank angle to the shape's centre line.

Cut depth	0 gives exactly the depth that brings the apex to the surface. Less, and the roof levels off into a flat top; more, and it stops short.
Pass pitch	How far each pass steps in. 0 uses the bit's own engagement.



3D roughing

Three strategies take the bulk of the material off a 3D model, leaving a little for

finishing. Use the biggest bit that reaches.



3D Adaptive Clearing

Holds a constant load on the bit, as 2D adaptive does. **Optimal load** 0.1 to 0.2 is normal; each level can be deep.



3D Pocket Clearing

Works level by level, clearing each level like a pocket.



3D Parallel Clearing

Works level by level in parallel raster lines.

Their shared settings:

Model depth	How deep to go. 0 takes the depth from the model, which is what you normally want.
Rough depth per level	How far down each level steps. 0 lets the operation choose.
Machining limit boundary	Model boundary , Material boundary or Selected vector(s) , with a Boundary offset to grow or shrink it.
Machining allowance	Material left on every surface for the finishing pass (0.5 mm to start). Leave some: it gives the finish something even to cut.
Stepover	For pocket and parallel clearing, the fraction of the bit's diameter between passes.
Profile pass, Order	Pocket clearing only. A final loop round each level, and whether to work Level by level or Region by region .
Raster angle, Avoid re-cutting cleared areas	Parallel clearing only.
Entry	Ramp or plunge.

The forms warn you when the model is deeper than the machine can reach.



3D finishing

Four strategies make the finished surface with fine, closely spaced passes. The stepover here is what you will feel with your hand: halving it roughly doubles the

time. The finish pass normally uses a ball-nose bit.



3D Parallel Finishing

Parallel passes across the model at a **Raster angle**. This is the one with extra options: **Zig-zag** to cut both ways, **Space the passes along the surface (constant cusp)** to crowd passes together on slopes so the ridges stay even, and **Waterline the steep walls** to finish anything steeper than the **Steep angle** (45°) with level contours instead.



3D Scallop Finishing

Passes spaced to leave an even scallop height all over.



3D Contour Finishing

Passes that follow offsets of the outline.



3D Pencil Finishing

Traces the inside corners and creases a larger bit could not reach. Run it after another finish.

Their shared settings are the **Model depth**, the **Machining limit boundary** (with an offset of 0.1 mm to start, so the finish runs just past the edge), the **Stepover** (0.08 of the bit's diameter to start), the **Cut direction**, and a **Stepover retract** that lifts the bit slightly between passes so it does not drag chips across the surface.

The strategy is fixed by the command you chose, and the form's heading names it. To use a different finish, add that operation.



The Toolpaths list

The **Toolpaths** tab on the right lists every operation in cutting order, with its tool and depth. The bar at the top chooses whether you see **This sheet**, the **Selected** sheets or **All sheets**.

- The eye on each row shows or hides it. Hidden toolpaths are left out of **Simulate Visible Toolpaths**.
- ▲ and ▼ move the selected operation earlier or later.
- Double-click a row to edit it. Right-click for **Rename...**, **Edit...** and **Delete**.
- A row marked **⚠ recalc** is out of date: the shapes it was made from have changed since. Double-click it and press OK, or use **Recalculate Selected**, before you cut.
- A locked operation carries a **locked** badge.

The buttons under the list repeat the common commands: previews, checks, export, delete and clear.



Operations

On the ribbon under **Manufacture ► Operations**:



Recalculate Selected

Rebuild the chosen operations from their bit and settings. Use it after editing the shapes they were made from.



Recalculate All

Rebuild every operation, for instance after changing Job Setup.

Lock / Unlock

Freeze an operation that is right. A locked operation keeps its moves: it is never recalculated, flagged out of date or deleted, and the shapes it was made from can no longer be selected, so nothing can move them out from under it.



Merge Toolpaths

Reorder so that operations using the same bit run together, for fewer tool changes. The order within each group is kept.



Optimize Order

Reorder to reduce travel between operations. It changes the sequence only, never what is cut.



Clear Toolpaths

Delete every toolpath in the job. The drawing is left alone.

Every toolpath is saved in the `.cvc` file with the drawing, so reopening a job brings back its toolpaths exactly as they were.

Previewing before you cut

Watching the job carve on screen, taking the waste away to see the part, and the checks worth running before the file goes to the machine.

Why preview at all

A toolpath drawn as lines over the design tells you where the bit goes. It does not show you what is left afterwards. The simulation does: it carves a block of the job's material, pass by pass, with the real shape of each bit, and what you see at the end is the part the machine will make. A profile on the wrong side of the line, a pocket too deep, a V-carve that runs out through the back of the board, tabs that are not where you wanted them: all of these are obvious in a preview and expensive at the machine.

Previewing works on the trial too.

Toolpaths as lines

Every toolpath is drawn over the design as soon as it is made. In the 2D view you see the path from above. In the 3D view the lines sit at their real depths, which is the quickest way to check that a cut goes as deep as you meant. Hide toolpaths you are not interested in with the eye in the Toolpaths list.



Running the simulation

The commands are under **Manufacture ► Simulate**, in the Toolpaths menu, and as buttons under the Toolpaths list.

	Simulate All Toolpaths	Carve the whole job, operation by operation.
	Simulate Visible Toolpaths	Carve only the operations whose eye is on. Quicker when you want to check one pass.
	Simulate Selected Toolpath	Carve only the operation selected in the list.



Show Final Result (no playback)

Carve everything at once and show the finished shape, without the animation. The fastest way to check the result.

Back to 3D View

Clear the carved block and show the model, vectors and toolpaths again.

The view switches to 3D and the **Carving Simulation** panel appears under the Toolpaths list. It shows "Preparing..." for a moment while the block is set up.

The playback controls

↶ Reset

Rewind to the uncut block.

✕ Exit simulation

Stop and go back to the ordinary 3D view.

Scrub bar

Drag to any point in the job.

⏮ and ⏭

Jump to the start, or straight to the finished part.

◀ Op and Op ▶

Jump back or forward one operation.

▶ Play

Play or pause.

Speed

From 0.1× to 8×. At 1× the whole job plays in about 18 seconds, however long it would take on the machine.

Loop

Replay continuously.

Show toolpath

Draw the toolpath lines over the carving.

Show vectors

Draw the design over the carving. Turn it off to see the bare cut.

Show rapids

Draw the moves through the air between cuts: retract, traverse and plunge.

Draw tool

Show the bit moving as it cuts.

The **Cut by** legend lists each operation with its colour in the carving, and the one being cut is shown in bold. A plate at the top-left of the 3D view gives the operation, the tool, the tool's position, the feed and the spindle speed as the job plays.

If you change a toolpath while a simulation is loaded, the panel says "Toolpaths changed — press Play to rebuild".

Dropping the waste

When the job cuts right through the board, the simulation knows which pieces have come free. Double-click a piece of waste in the 3D view to lift it off and see the finished part on its own. Tabs are treated as already snapped, so a part cut out on tabs drops free of its surround.

Undo drop puts back the last piece and **Restore waste** puts back all of them. Replaying the simulation restores them too. If nothing has been cut free yet, you are told so; double-click on the waste itself and not on the part.



Saving a picture

Photo saves a picture of the carving as it stands, as a PNG or JPEG. It is handy for showing a customer what they will get before any material is cut.



Estimate Time

Manufacture ► Simulate ► Estimate Time adds up how long the job will take: time spent cutting, in rapid moves, dwelling and changing tools, and the total. It works from the feed rates in the toolpaths, and assumes rapid moves at 3000 mm/min and 15 seconds for each tool change.

Treat it as a guide. A path full of short moves takes longer on a real machine than the arithmetic says, because the machine never reaches full speed between corners.



Check Gouges

Check Gouges looks at every cutting move in the job.

- With nothing selected, it checks that every cut stays within the stock.
- With a shape selected, it also checks that nothing cuts outside that shape, allowing for the radius of the bit (an outside profile is meant to run wide of its line by that much).

"Nothing cuts where it should not" means the job passed. Otherwise each operation that strays is listed with what it does wrong.



The job sheet

Job Sheet / Report... makes a summary of the job to take to the machine or hand to whoever runs it: the job and its material, every toolpath in the order it runs with its tool and depths, the tools used with their tool numbers, and the estimated time.

Save HTML... saves it as a file you can open in any browser and print.



Out-of-date toolpaths

When you edit a shape that a toolpath was made from, or change the job setup, the toolpath is flagged **⚠ recalc** in the list and keeps its old moves until you rebuild it.

The simulation and export both use what the toolpath holds, so recalculate before you preview for the last time. **Recalculate All** does every one at once.

Output and the first cut

Writing the G-code file, what the export window offers, double-sided jobs, and running a new job safely at the machine.



Exporting G-code

- 1 Check the status bar. The machine named there is the one the file will be written for.
- 2 Recalculate anything marked **Δ recalc** in the Toolpaths list.
- 3 Choose **Manufacture ▶ Output ▶ Export G-code...** for every toolpath, or **Export Selected...** for just the one selected in the list. Both are also in the toolbar's Export menu and in the Toolpaths menu.
- 4 The **Export G-code** window opens with the program in a preview pane.
- 5 Press **Save G-code...** and choose where to save it. In a project, the window starts in the project's G-code folder.

On the trial, step 3 stops with a message instead. Everything up to it works.

The export window

Controller	The post-processor the file is written with. It starts on the active machine's post. Changing it here affects this export only.
Units	Controller default uses the post's units. Millimetres or Inches overrides them for this file.
Preview	The program as it will be saved. Scroll through it to check the header, the first tool change and the first moves.
Files	One file writes the whole job as one program. One file per bit writes a program for each bit, in the order they cut: toolpaths that follow each other with the same bit share a file. One file per toolpath writes each operation as its own program. Files are named by their place in the sequence and their name, and the button reads Save files... and asks for a folder.

The file extension comes from the post.



Tools and tool changes

Tools are numbered in the order the program first uses them: the first bit is T1, the next different bit T2, and so on. Where the job changes bit, the post writes its tool-change block.

Whether the machine can act on that depends on the machine. One with an automatic tool changer swaps the bit itself. Without one, not every controller stops and waits, and none can set Z zero for the new bit. So when the active machine has no tool changer (**Automatic tool changer** in its settings) and the toolpaths use more than one bit, the export window starts on **One file per bit**. If you choose **One file** anyway, you are asked to confirm. A V-carve inlay with a clearing bit is the usual case: the pocket board needs two files, clearing and then V-carve, and so does the plug's.

Run the files in order. Before each one, fit its bit and set Z zero again.

Export writes the boards the Toolpaths list is showing. On **This sheet** that is the board in front of you. On **All sheets**, or with several boards **Selected**, every one of them is exported, and each board's files go in a folder named after the board. Each file is named for what it cuts and the bit it needs, for example `01_V-Inlay-Plug-clearing-1-4-Flat-End-Mill`.

Manufacture ► Operations ► Merge Toolpaths reorders a job so that operations sharing a bit run together, which means fewer changes and fewer files.



The machine envelope check

Before writing, every move is checked against the active machine's travel. If anything is outside it you see **Outside machine envelope**, with each axis that overruns and by how much, and the choice to export anyway. Say no unless you know the machine setup in Carvect Pro is wrong. The check is only as good as the travel entered for the machine.



Exporting a double-sided job

A double-sided job is cut in two setups, so each face is exported as its own program. Export asks which to write: **Side 1**, **Side 2** or **Both**. Side 2 is mirrored for the flip automatically, about the axis you chose in Job Setup, so you draw it as it will look and the program places it correctly after the board is turned over.

The same box reminds you how to zero Z. With **Zero off same side** on, keep the Side 1 zero and do not re-zero after the flip; Side 2 is offset by the stock thickness. With it off, zero on each side's own surface.

Run Side 1, turn the board over about the chosen axis, clamp it with the same datum corner in the same place, and run Side 2.



Running a new job

A new job, a new machine or a new post deserves a dry run.

- 1 Load the file on the machine's control.
- 2 Zero X and Y at the job's datum: the corner (or centre) you chose in Job Setup, plus any offset.
- 3 Set Z about 20 mm above where it should be, and run the program in the air. Watch that it traces the shapes you expect, in the right place, at sensible speeds.
- 4 Stop, re-zero Z on the surface you chose (the top of the material, or the bed), and run it for real.

Keep the job sheet beside the machine. It lists each operation and its tool in order, which is what you need when the program stops for a tool change.

Other files you can write

File ► Save As... also writes `.svg` and `.dxf`, for sending the vectors on the active sheet to another program. The **Photo** button in the simulation saves a picture of the carving, and the job sheet saves as an HTML page.

Problems and shortcuts

What to check when something does not work as expected, how to reach us, and the keyboard shortcuts.

Drawing and importing

The Design tools are greyed out. The job has not been set up. A new job has no stock; fill in Job Setup and press Apply.

An imported SVG is tiny, huge, or off the stock. SVG files carry their own units and not every program writes them the same way. Select the drawing and use **Resize to Fit Job**, or **Scale in 2D...** if you know the size it should be.

A pocket or V-carve comes out empty, or fills the wrong area. The shape is probably open. Use **Highlight Open Vectors**, then **Weld / Close Gaps...** or **Join Vectors**. If shapes overlap, check the toolpath's **Overlapping vectors** setting, or use Select Areas.

Text looks different on another computer. The font is not installed there. Convert the text to curves before moving the job.

Toolpaths

A toolpath is marked Δ recalc. The shapes it was made from, or the job setup, have changed since it was made. Double-click it and press OK, or use Recalculate All.

A pocket leaves material in narrow places. The bit is too big to fit. Add a second pocket with a smaller bit and tick **Rest machining**, so it only cuts what the first left.

A cut-out part is still attached by a thin skin. The cut depth is equal to or less than the real thickness of the sheet. Measure the sheet, and set the profile's depth a few tenths past it. Check that Z zero in Job Setup matches where you touched off.

Parts come loose and move during the last pass. Add tabs to the profile.

The machine name in the status bar is red. The stock is bigger than the machine's travel. Either the job is too big for this machine or the travel in the Machine Library is wrong.

The feed rates look wrong for my machine. Automatic feeds fill new operations from the material and the bit. Edit the numbers in the Material Database so they match what your machine likes, or turn **Auto Feeds & Speeds** off in the Machine menu and set feeds on the bits.

The preview

The simulation is slow, or the 3D view is sluggish. Lower the **Modeling Resolution** in Job Setup while you work and raise it for the final check. For a large STL, use **Reduce Mesh....**

The model covers the carving. Turn off **View ► Show 3D Models**, or press **Back to 3D View** and then Show Final Result.

Nothing drops when I double-click. Only pieces that have been cut free can be dropped, and the double-click has to be on the waste itself.

G-code and the machine

Export says G-code is kept back. This copy is on the trial. Buy a licence or, if you already have one, open Account & Licence and press **Check again**.

The machine moves 25.4 times too far, or too little. The file's units are not what the machine expects. Check the **Units** setting in the export window and in the post.

Arcs come out as loops or wild curves. Check **Arc IJK absolute** in the post, or turn **Arcs (G2/G3)** off so curves are written as short straight moves.

The control rejects every line. Try the other **Line ending**, and check that the **Comments** style is one the control accepts.

The cut is in the right shape but the wrong place. The machine was zeroed somewhere other than the job's XY datum. Check the datum corner and any offset in Job Setup.

Licence and account

"This licence is already installed on 2 computers." Release one: in the application on that computer (Account & Licence ► Release), or on your account page on carvect.com (Computers ► Free seat). Then press Check again.

"That licence key belongs to a different account." Sign in with the email address you bought with, then enter the key.

"This licence was issued for a different machine." An offline licence file only works on the computer whose id it was made for. Issue one for this computer's id from your account page.

Updates show as locked. The release came out after your included year of updates. The version you have keeps working.

I bought, but the application still says Trial. Make sure the application is signed in with the email you bought with, and press **Check again**. The licence can take a minute or two to reach your account after payment.

A reinstalled computer counts as a new one. This happens when the computer's id could not be read from its hardware (the Account & Licence window says so). Release the old entry on your account page to free its place.

If the application closes unexpectedly

Start it again. If autosave was on, it offers to restore your unsaved work. If a problem repeats, the log files in the application's Logs folder (see *Where your own files and settings live* in Getting started) are what we need to see.

Getting help

Hover over any control for an explanation of it. The guides on carvect.com go into the reasoning behind feeds, tabs, V-carving and clearing in more depth. For anything else, write to support@smepoint.com from the address your licence is registered to, and say which version you are running (Help ► About Carvect Pro) and on which system.

Keyboard shortcuts

On a Mac, use ⌘ where Ctrl is shown.

Files and editing

Ctrl+N	New job
---------------	---------

Ctrl+O	Open
---------------	------

Ctrl+S	Save
---------------	------

Ctrl+Shift+S	Save As
Ctrl+Z	Undo
Ctrl+Shift+Z	Redo
Ctrl+C, Ctrl+X, Ctrl+V	Copy, cut, paste
Ctrl+D	Duplicate
Ctrl+A	Select all
Delete	Delete the selection
Ctrl+G	Group
Ctrl+Shift+G	Ungroup
Ctrl+Q (⌘Q on a Mac)	Quit
Drawing	
L	Line
P	Polyline
R	Rectangle
C	Circle
A	Arc through three points
D	Arc from its centre
B	Bézier curve
T	Text
Esc	Abandon the current shape
Enter	Finish a polyline, or accept a typed value

F12, or Ctrl+Shift+D	Dynamic Input on or off
-----------------------------	-------------------------

Views

Mouse wheel	Zoom
--------------------	------

Middle button drag	Pan
---------------------------	-----

Left drag (3D)	Orbit
-----------------------	-------

Right drag (3D)	Roll
------------------------	------

+ and –	Zoom in and out
----------------	-----------------

Ctrl+0	Fit the job in the 2D view
---------------	----------------------------

Ctrl+Shift+M	Hide or show both side panels
---------------------	-------------------------------
