Microcarpentry's Laser Cutting Resource List
Accumulated by Richard Lawler - Microcarpentry.com/blog

The inclusion of any specific product or service in this list does not connote an endorsement.

Products marked with a 👏are products that I have tried **and** recommend.

Laser Cutting Safety - Toxic Fumes and Laser Safety

Laser cutters produce a lot of nasty, smelly fumes and contaminants when cutting and engraving even common materials. Collectively these gaseous fumes and contaminants are referred to as laser-generated airborne contaminants -- ***LGACs****.*

Even if you limit yourself to only cutting plywood and acrylic the ***LGACs*** *include toxins and carcinogens like:*

- *Benzene,*
- *Ethyl acrylate,*
- *Formaldehyde,*
- *PAHs.*

Since the ***LGAC*** *exhaust output from all laser cutters is effectively* ***poisonous to humans****, one must do something with the bad exhaust air in order to operate a laser cutter safely.*

👏**"Emerging Health and Safety Issues in Makerspaces"**
- Daniel Herrick and Robert Klein.
Proceedings of the 1st International Symposium on Academic Makerspaces, 2016
http://seas.yale.edu/sites/default/files/imce/other/ISAM%20Makerspace%20Emerging%20Safety%20Items.pdf

Laser Safety
https://en.wikipedia.org/wiki/Laser_safety

Microcarpentry.com - My design for a Laser Cutter Exhaust Vent Filter
I designed and built this system
👏**Instructable: Fume Coffin - Laser Cutter Exhaust Vent Filter**
https://www.instructables.com/id/Fume-Coffin-Laser-Cutter-Exhaust-Vent-Filter/
👏**Instructable: Improved Pre-Filter design for Fume Coffin**

https://www.instructables.com/id/Fume-Coffin-Pre-Filter/

Instructable: DIY Fume Extractor (Exhaust Air Scrubber)
http://www.instructables.com/id/Build-a-laser-cutter-fume-extractor/

DIY Laser Engraver Filtration Table
https://lookinto.com/home/48885/diy-laser-engraver-filtration-table-home

Extracting Laser Generated Airborne Contaminates
https://www.vodex.co.uk/lgac

Laser Safety Fundamentals
https://www.ehs.washington.edu/manuals/rsmanual/lasermanual.pdf

Laser Classification
http://www.lasersafetyfacts.com/resources/Spreadsheet---laser-classes.pdf

Laser Cutter Safety
https://www.cmu.edu/ehs/fact-sheets/laser-cutter-safety.pdf

Wood Toxicity
http://www.wood-database.com/wood-articles/wood-allergies-and-toxicity/

Lasers Cutters and Vendors

LightObject

Sacramento-based Importer of Chinese CO2 laser cutter machines and parts.

Glowforge

The Glowforge is a consumer-oriented CO2 laser cutter. It is available in three models:
Basic model ($2495) - 40W laser, Class 1 laser product, 6 month warranty.
Plus model ($3995) - 45W laser, Class 1 laser product, 6 month warranty.
Pro model ($5995) - 45W with Peltier cooling and pass-through slot for longer materials. Class 4 laser product, one year warranty.

My discussion of the Glowforge is here.

Full Spectrum

Las Vegas-based company sells hobby and industrial lasers based on Chinese CO2 glass laser tubes. Full Spectrum uses their own multi-platform software for control.
Full Spectrum H-Series (start at $3500)
12"x20" - 40W or 45W laser. Removable bottom panel. Rotary attachment available.
Full Spectrum Muse (start at $5000)
Similar to H-Series. 12"x20" 40W or 45W. Removable bottom panel.
Adds LCD control panel and camera for material registration and tracing.

The Full Spectrum Muse is also sold by Dremel as the DC40.

Epilog
US manufacturer of industrial laser cutters
Zing 16 - 16x12 (start at $8000)
Zing 24 - 24x12 (start at $11000)
US-made Metal-tube RF CO2 lasers

Automation Technologies
http://www.automationtechnologiesinc.com/products-page/laser-engraving

Rabbit Lasers

Boss Lasers

K40 aka Shenhui SH G350
Classic cheap Chinese-sourced blue and white laser cutter. Sold on eBay or Alibaba.
Typically claimed to have an 800mm 40W tube, but often tests out as much less powerful.
$300 and up.
The K40 is not compatible with *LightBurn* software without a controller upgrade.

Redsail X700 and clones
Another widely-copied Chinese design with a 700x500mm cutting area. Red case. Sold on eBay or Alibaba.
$1500-$3500.

Universal Lasers
US Manufacturer

Lasersaur

Open-source laser cutter project. BOM is $8400.

http://www.lasersaur.com/manual/boms/bom-1403-suppliers-usd

BuildLog

DIY Laser Cutter designs
BuildLog 2.x Laser
http://www.buildlog.net/blog/2011/02/buildlog-net-2-x-laser/

Laser Open Source

https://redmine.laoslaser.org/projects/laos/wiki/Software_overview

DIY CO2 Lasercutter

http://www.instructables.com/id/Make-Your-Own-High-Quality-CO2-Lasercutter-With-To/

About CO2 Laser Tubes

This page is a collection of useful odds and ends related to CO_2 lasers.

http://www.parallax-tech.com/faq.htm

The two major causes of laser tube damage:

1. Running a laser without coolant flow. Always start the coolant flow **before** starting the laser. If necessary, install a fail-safe flow sensor switch between the cooling system and the laser cutter.
2. Overdriving. (e.g. operating a 60-Watt laser at 75-Watts.) Lasers are sometimes advertised based on their maximum output power. But the headroom between a laser's normal output and its maximum output is provided to allow the laser tube to operate at its normal output throughout its entire expected operational life.)

https://www.parallax-tech.com/warranty.htm#major_cause

Sam's Laser FAQ

👋**Sarbar Multimedia**

This video series will teach you all about Chinese-made laser cutters.

Russ Sadler starts with a generic 1000 GBP Chinese laser cutter and learns how it works, tests its limits and tries to fix its flaws through a series of video explorations.

https://www.youtube.com/user/SarbarMultimedia/videos

Laser beam calculator

https://www.controllaser.com/resources/laser-beam-spot-size-and-depth-of-focus-calculator/

Laser Power Measurement

👋**DoHICky** (30 GBP + approx $16 for 6802II)

Russ Sadler (of Sarber Multimedia) sells a clever device he calls the DoHICky. It is a calibrated anodized aluminum probe/heatsink that is used in conjunction with a low-cost electronic temperature gauge (Electronic thermometer 6802II) to measure output power in Watts from a laser at any point of interest in the laser's path.

Technically the DoHICky and thermometer form a temperature comparator. The change in temperature (delta-T) it measures is proportional to the laser's power.

A laser power measurement goes like this:

- Place the DoHICky probe in the path of the unfocused laser beam and run one of three standard cutting programs -- 0-40W, 0-80W or 0-160W.
- The thermometer measures the delta-T (the increase in temperature above the ambient starting temperature) of the probe caused by running the cutting program.
- The DoHICky has been calibrated such that delta-T in degrees C times a multiplier is equal to the laser power. The multiplier (1x, 2x or 4x) depends on which program was used.

Macken P100C ($340)

Analog probe, NIST certified

https://www.macken.com/collections/analog-power-probes/products/p100c

Bell-Mahoney (approx $110)

Chinese-made analog probe

https://www.bell-laser.com/coherent-co2-laser-gas-refill-meter

https://www.amazon.com/Infrared-Mahoney-Laser-0-100-Power/dp/B01LL7YZ38

CO2 Laser Tube Manufacturers and Suppliers

👋**LightObject**

Importer of Chinese laser tubes and laser cutters and other parts.

Located in Sacramento Calif.

http://www.lightobject.com/Search.aspx?c=14

Reci

Reci lasers are considered to be among the more reliable Chinese-made glass CO2 lasers.

http://www.recilaser.com/en/

Cloudray Laser
Large catalog of CO2 laser tubes, parts and accessories.
Located in and ships from Nanjing China.
https://www.cloudraylaser.com/

Laser Cooling Systems

LightObject - Cooling Systems

👏**S&A CW-5000** (~$600) - active water chiller

General Information on Using Laser Cutters

Sculpteo - Ultimate Guide to Laser Cutting.pdf

Obrary - Laser Cutter 101.pdf
Obrary - Laser Cutter Adv Techniques.pdf
Obrary - Laser Cutter Business Guide.pdf

Full Spectrum Laser - Designing for Laser Cutting eBook

Materials for Laser Cutting

Microcarpentry.com - Materials for Laser Cutting
My List of Laserable Materials
https://docs.google.com/document/d/1glqWfMCJt41fGLwk6VSH5XEzaAuH-OrfFwxiNB7ZOEw/edit?usp=sharing

Materials for Laser Cutting
https://www.pololu.com/docs/0J24/3

Safe Laser Cutter Materials
http://atxhackerspace.org/wiki/Laser_Cutter_Materials
http://tcmaker.org/wiki/index.php?title=Laser_Cutter_Materials

MatWeb
Materials Information
http://www.matweb.com

Laser Cutting Materials
http://www.cutlasercut.com/laser-cutting-materials-laser-engraving-materials

Plastics Processing Guide
Synrad - Plastics Laser Processing Guide

21 Design Ideas Using 5 Materials Most People Don't Know About
(Cardstock, Leather, Delrin, Polarizing Film, Felt)
http://www.ponoko.com/blog/2017/02/21/21-design-ideas-secret-weapon-materials/

Material Suppliers

http://ocoochhardwoods.com/scroll_saw_lumber.php

http://www.laserbits.com/wood-sheets/laser-wood-laminates.html

http://www.johnsonplastics.com/engraving/engravable-sheet-stock/wood

http://www.bellforestproducts.com/
Ishpeming, MI

http://www.mountstorm.com/
Windsor, CA

http://delviesplastics.com/

https://www.inventables.com/

Amazon.com (¼" plywood example)

https://www.interstateplastics.com/Acrylic-Red-2423-3m031-Cast-Paper-masked-transparent-5-Sheet-ACRR4CPSH.php

Template Generators

👋**The Ultimate Guide to Laser-cut Box Generators**
An actively updated list of box generators.

👋Boxes.py - webapps

http://www.festi.info/boxes.py/

Open source box generators

A tour-de-force collection of configurable boxes, parts and variations are available here.

- Traditional boxes
- Flexbox - boxes with living hinge corners
- Boxes with hinged and separate lids
- Rounded boxes with non-90-degree corners
- Tray inserts for boxes
- Shelf bins and other storage solutions for parts, wine, etc.
- Knobs, gears, arms

Tabbed Box Maker for Inkscape - a plug-in for Inkscape

https://github.com/paulh-rnd/TabbedBoxMaker

Boxdesigner - webapp

http://boxdesigner.frag-den-spatz.de/

Generators for lots of kinds of boxes.

(Note: there is a button for English at the lower right.)

Gallery: http://boxdesigner.frag-den-spatz.de/galerie.html

Cardboard template generators - webapp

This site has a rich collection of generators for boxes and other model shapes, but they are designed for cutting and folding paper or cardboard. With that in mind some may be adaptable for laser-cutting with some modification and within the constraints of the medium and tool.

(under each generator click "More Options" and you can select units and file formats, including DXF):

http://www.templatemaker.nl/

👋MakerCase - webapp

generate laser cut wood/cardboard boxes with interlocking grooves:

http://www.makercase.com/

Box Designer - webapp

Another box generator

http://boxdesigner.connectionlab.org/

Wood Gears Template Generator - webapp
http://woodgears.ca/gear_cutting/template.html

Gear Generator - webapp
http://geargenerator.com/#200,200,100,6,1,3,1818.8999999999069,4,1,8,2,4,27,-90,0,0,16,4,4,27,-60,1,1,12,1,12,20,-60,2,0,60,5,12,20,0,0,0,2,-329

HTML Spirograph - webapp
http://htmlspirograph.com/#0,50,0,1,1,-1.44,30,-700,1174,2.5,120,860,-3.6,100,1050,75,0,0,1,1064

"Joinery" - webapp
https://clementzheng.github.io/joinery/
https://www.instructables.com/id/Joinery-Joints-for-Laser-Cut-Assemblies/

Nesting

SVG Nest
Cloud-based open source SVG nesting.
http://svgnest.com/

Deepnest.io
Open source nesting software. Downloadable application for Windows, Mac and Linux. Inputs and outputs DXFs and SVGs.
http://deepnest.io/

NESTER for Fusion 360 nesting script see below

Designs

Thingiverse:
lots of laser cutter and other design files for free:
http://www.thingiverse.com/

Lamp shade project
http://www.instructables.com/id/Universal-lamp-shade-polygon-building-kit/

Laser cutting and engraving design contest winners
http://www.loftwork.com/blog/pickup/youfab2012/en/
http://www.loftwork.com/blog/pickup/youfab2013/en/

Nervous Kinematic interactive necklace designer
An interesting application for inspiration.
https://n-e-r-v-o-u-s.com/kinematics/?t=0

UGears
Laser cut models
https://ugears.online/

Instructables
https://www.instructables.com/tag/type-id/category-workshop/channel-laser-cutting/

Pinterest
Huge source of design ideas and inspiration
https://www.pinterest.com/

Etsy
Huge marketplace for handcrafted projects

Other laser cutting plan sources:
http://cartonus.com/category/laser-cut-wood/

http://www.dxfplans.com/

http://www.lasercutplans.com/

http://www.makecnc.com/

http://www.lisaboyer.com/Claytonsite/robotlaboratory.htm

http://wood-toolbox.com/

Joinery

👋**Make Skill Builder — CNC Panel Joinery**

A treasure chest of clever joints collected by Sean Michael Ragan at Make. Most of these designs and ideas are suited to laser cutting as well as CNC router.
http://makezine.com/projects/make-33/cnc-panel-joinery-2/
http://makezine.com/2013/01/25/cnc-joinery-notebook-update-1/

Digital Wood Joints
Most of these are designed for CNC router, but there are some interesting ideas.
http://winterdienst.info/50-digital-wood-joints-by-jochen-gros/
A poster with all 50 joints:
https://www.instructables.com/files/orig/FW1/4AF2/I2VLGSNJ/FW14AF2I2VLGSNJ.pdf

Universal Snap Fit
A snap fit independent of material thickness and laser kerf
https://tltl.stanford.edu/project/universal-snap-fit

Software Tools for Laser Cutting Design

👋**Autodesk Fusion 360**
Professional-grade CAD/CAM design software.
For Mac or Windows.
Projects and files are stored on the web, but can be used offline.

Autodesk offers free licenses for hobbyists, students and educators, startups.

Personal/hobby non-commercial use:
https://www.autodesk.com/campaigns/fusion-360-for-hobbyists

Commercial use by startups making less than $100K with 10 or fewer employees.
(Note: this license does not allow commercial freelance or contract work):
https://www.autodesk.com/campaigns/fusion-360/startups

Non-commercial use by educators and students:
https://knowledge.autodesk.com/customer-service/account-management/education-program/free-education-access/licenses-for-students-educators

Professional commercial use is $60/mo or $495/year

http://www.autodesk.com/products/fusion-360/

Learning Fusion 360

Fusion 360 Add-ins

👏**Fusion 360 Plugins Collection**

https://tapnair.github.io

Autodesk's Patrick Rainberry has lots of useful add-ins for Fusion 360. Some of the highlights:

- Dogbone - adds dogbone paths to cuts such as fillets to be cut with a CNC router (because CNC can't do sharp angled inside cuts).
  👏An updated version 2 is here: https://github.com/DVE2000/Dogbone
- Venter - creates a typical electronics enclosure vent.
- Parameter Edit - allows interactive editing of user parameter values.
- 👏Nester - lays out components on a plane for laser cutting multiple parts in one run.
- 👏Fusion Slicer Import - imports the directory of DXF files output from Slicer (see below).
- 👏Copy Paste Body - create an un-associated copy of a body.
- 👏ShowHidden - shows hidden bodies.
- Helix - create pseudo-helix in Sketch module. Can be used as a basis for custom threads.

👏**Parameter I/O** - import/export all the parameters in a design as a CSV file.

- https://apps.autodesk.com/FUSION/en/Detail/Index?id=1801418194626000805

👏**DXF for Laser** - Ross Korsky

Output DXF cut files for laser cutting with kerf adjustments. This add-in will generate a DXF file from a selected face in a single operation eliminating the need to generate a Sketch first. If you find you need to compensate for the kerf (cut thickness) of your laser cut this plug-in is very useful.
https://apps.autodesk.com/FUSION/en/Detail/Index?id=7634902334100976871&os=Mac&appLang=en

Note: There is a bug in DXF4Laser 1.1.2 that prevents it from showing up in the menus of Fusion 360 since the 2019 UI redesign. To fix this problem you need to edit the DXF4Laser.py script file.

- DESIGN workspace> TOOLS Tab> ADD-INS dropdown> script and addins> Add-ins tab> DXF4Laser> Edit
- Change 'SketchPanel' to 'SolidModifyPanel' in add_button and remove_button Button will appear In SOLID tab> Modify
- Restart Fusion 360

👏**Nicebox360** - by CopyPasteStd
Creates a simple box of your specified dimensions with a Sketch file for each face. There is a single finger joint on each edge.
https://apps.autodesk.com/FUSION/en/Detail/Index?id=3012670521465945402&os=Mac&appLang=en

Note: There is a bug that prevents Nicebox360 from showing up in the menus of Fusion 360 since the 2019 UI redesign.

👏**Slicer for Fusion 360**
Slicer works as a Fusion 360 plugin and standalone app for Mac or Windows
Converts a solid model into a sliced laser-cuttable design that can be assembled by stacking layers of plywood or cardboard.
(Formerly called **123D Make**)
(*Slicer for Fusion* is not the same as the 3D printing tool called Slicer or Slic3r.)
Slicer for Fusion 360 is no longer being maintained or supported by Autodesk, but the final build for Mac and Windows is available at the link below.

https://knowledge.autodesk.com/support/fusion-360/downloads/caas/downloads/content/slicer-for-fusion-360.html
Video: YouTube: Slicer for Fusion 360

NC Viewer
Interactive G-Code viewer.
Available as a webapp in your browser at https://ncviewer.com/
Also available as a plugin palette in the Fusion 360 Manufacture workspace. (It's probably easier just to use the web app.)

https://apps.autodesk.com/FUSION/en/Detail/Index?id=2936176173947597837&appLang=en&os=Mac&autostart=true

Using Fusion 360 for Laser Cutting

👏YouTube: Designing a Lasercut Laptop Stand with Fusion 360

This essential tutorial by Autodesk's Taylor Stein shows best practices for using Fusion 360 to create designs for laser cutting.

Using Fusion 360 for Laser Cutting

Fusion 360 for Laser Cutting - Follow-up

These tutorials demonstrate how to use Fusion 360's CAM module for preparing laser cuts.

[Note: These tutorials are a little out of date and reference menus and options that have since changed in Fusion 360, but the overall CAM strategies may remain valid.]
(In general, I don't think it's worth the trouble of using the Fusion 360 Manufacturing (CAM) module for laser cutting.)

Tips for using Drawing Software

Useful tips for using 2D Drawing apps for laser design

http://www.cutlasercut.com/resources/drawing-guidelines

👏**Euclidea - Geometric Construction Game**
https://www.euclidea.xyz/
This game for web, iOS and Android is a great way to develop your geometry skills.
Web browser: https://www.euclidea.xyz/en/game/packs
Android: https://play.google.com/store/apps/details?id=com.hil_hk.euclidea
iOS: https://itunes.apple.com/us/app/euclidea/id927914361

👏**Adobe Illustrator**
The classic 2D drawing software.
Illustrator is probably the best tool for adding artistic embellishment of your projects.
Very robust file handling tools.
Imports and exports DXF, SVG, PDF and AI.
$31.50/mo or $240/year or as part of Adobe CC.

👏**Inkscape**

Free, open-source 2D drawing software.

Includes import and export support for a wide range of file formats including DXF, SVG and AI.
For Mac, Windows, Linux
https://inkscape.org/en/

OnShape

https://www.onshape.com/
Cloud-based 3D CAD. Data is stored in the cloud and the CAD program runs in your browser.
Professional subscriptions with private data start at $1500/yr
A free version is available for makers with the caveat that all your projects will be public and open-source.
https://www.onshape.com/products/free

SketchUp

https://www.sketchup.com/
SketchUp 3D CAD software has a long history. It used to be a stand-alone desktop app for Mac and Windows. SketchUp has most recently moved to an in-browser web-based interface.

- SketchUp Free - web-based. It is missing essential features for laser cutting and CNC work: no support for export or import of DXF or SVG vector files and no solid tools (needed to create logical joins and cuts).
- SketchUp Shop ($119/yr subscription) - web-based, includes DXF import and export, includes solid tools.
- SketchUp Pro ($299/yr subscription) - includes both web-based and desktop versions.
- SketchUp Make 2017 (free) - discontinued but still available - this is a non-web-based desktop version without the Pro features. It is missing essential features for laser cutting and CNC work: no support for export or import of DXF or SVG vector files and no solid tools (needed to create logical joins and cuts).

Online-Convert

Online file converter can convert between many file formats, including DXF and SVG.
https://www.online-convert.com/
They also have a Chrome extension.

Photoshop Techniques and Plugins

Rodney Gold Method Photoshop Script (results similar to Photograv)

After applying the script to your liking, to save the file for the laser software, make sure your Image > Mode is set to Bitmap, then Save As type BMP, setting depth as 1-bit.

https://wiki.shapeoko.com/index.php/Image_Engraving:_The_Gold_Method

Etchtone Photoshop Plugin

http://andromeda.com/wordpress/individual-products/etchtone

eCut

Plugins for CorelDraw and Illustrator

http://eng.e-cut.ru/

http://illustrator.e-cut.ru/

http://mac.e-cut.ru/

SVGOMG

SVG nuts and bolts utility

https://jakearchibald.github.io/svgomg/

Laser Control Software

👋LightBurn

Better laser cutter control software. Highly recommended. Works on Mac, Windows and Linux. $80 for RuiDa DSP-compatible version.

Works with Voccell, RuiDa, and G-code based controllers.

The version that just supports G-code based controllers is $40.

The license covers software updates for 1 year and installation on 2 computers. Optional maintenance updates are $30/year.

https://lightburnsoftware.com/

Lasercut, RDWorks, Laserworks

These programs are variations of the same software. So they have many commands and features in common. Often you can find documentation for one variant that is applicable to the others.

Lasercut 5.3

http://www.leetro.com/english/index.htm

Rabbit Laser Manual (includes detailed Lasercut manual)

Alternate Manual

RDWorks

For RuiDa-brand controllers

http://en.rd-acs.com/

RDWorks software 8.10

RDLC220 Operation Manual 1.1

Alternate RDWorkslab.com Manual

VisiCut

Open source laser cutting software

http://hci.rwth-aachen.de/visicut

http://download.visicut.org/

LaserWeb

Open source G-code generator and controller for G-code-based laser cutters (Smoothie or Grbl controller). Runs in Chrome browser.

Test version

https://laserweb.github.io/LaserWeb4/dist/

Documentation

http://cncpro.co/

Source code

https://github.com/LaserWeb/LaserWeb4/

Community

https://plus.google.com/u/0/communities/115879488566665599508

Laser Cut Kerf Bending/Lattice Hinges

Engineering:

http://www.deferredprocrastination.co.uk/blog/2011/laser-cut-lattice-living-hinges/

http://www.deferredprocrastination.co.uk/blog/2011/lattice-hinge-test-results/

http://www.deferredprocrastination.co.uk/blog/2012/minimum-bend-radius/

http://www.deferredprocrastination.co.uk/blog/2012/lattice-hinge-design-choosing-torsional-stress/

Explorations:

http://www.core77.com/posts/36481/Adventures-in-Laser-Kerf-Bending

http://www.gedankensuppe.de/kerf-bending-patterns

http://www.instructables.com/id/Curved-laser-bent-wood/

http://lab.kofaktor.hr/en/portfolio/super-flexible-laser-cut-plywood/

http://obrary.com/products/living-hinge-patterns

Misc.

Metal marking:

Thermark & Cermark

http://www.engraversnetwork.com/products/thermarkcermark/

http://www.engraversnetwork.com/products/thermarkcermark/how-it-works/

http://www.thermark.com/TM_Downloads/TherMark_vs_CerMark.pdf

Dry Moly Lube

http://www.evilmadscientist.com/2013/laser-moly/

http://www.instructables.com/id/Laser-Marking-Stainless-Steel-1/

Plaster of Paris, isopropyl alcohol (and chrome polish)

http://frankieflood.blogspot.ca/2014/12/cermark-alternative.html

http://frankieflood.blogspot.ca/2014/12/laser-engraving-stainless-steel-w.html

Laserbond 100

https://www.laserbondingtech.com/

Adhesives and Fasteners

Wood glue

Super Glue (cyanoacrylate)

👏I have had good results with the Starbond brand. It is available in a variety of thicknesses.

https://www.amazon.com/Starbond-EM-2000-Thick-PREMIUM-Woodturning/dp/B00C32MKLK

Super Glue Accelerators

Apply the super glue to one surface and spray the accelerator on the other surface. Put the parts together. The glue bond freezes in seconds. Alternately, the accelerator can be spray applied after parts have been glued and assembled. *Caution*: Unlike traditional super glue application you don't get a second chance if

you glue something wrong because the bond cannot be separated once the parts have been in contact for a few seconds.

👏Fastcap 2P-10 Super Glue Adhesive
https://www.amazon.com/gp/product/B0006IUWCC

👏Starbond Instant Set Accelerator
https://www.amazon.com/gp/product/B00BUVAY9K

High temperature glue gun

👏Hardens faster than a standard glue gun. Generally produces less mess.
Surebonder
https://www.amazon.com/exec/obidos/ASIN/B00HC18CIM

Pop rivets

👏Pop rivets are easy and fast permanent fasteners. You must prepare you parts with pre-drilled holes of the required diameter. You will need a pop rivet "gun" that is compatible with the diameter of the pop rivets. Pop rivets are available in a wide variety of diameters and lengths and materials including aluminum, stainless steel and plastic.

Magnets

How do they work? You can attach a magnet with glue, or use a washer-shaped magnet held in place with a screw or a pop rivet (be careful; magnets shatter easily). Then all you need is a steel part on the opposite surface to attach to.

Bonding & Annealing Acrylic and other Plastics

http://www.boedeker.com/anneal.htm

http://polyfab.biz/annealing-acrylic.php

Plexiglass - Acrylic Sheet Fabrication Manual

Acrylic glue
https://www.tapplastics.com/product/repair_products/plastic_adhesives

Acrylic Cement
Industrial Use Only

Tap Acrylic Cement
Similar to Weld-On 4
https://www.tapplastics.com/uploads/pdf/Product_Bulletin_2-2016a.pdf

IPS / SCIGRIP
Weld-On 3 - very fast set - one component
Weld-On 4 - fast set - one component
Weld-On 40 - two component