Machine Tutorials

How to use the different machines
of a make-a-thek space

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Summary

A makerspace is not just a room filled with machines. It really comes alive when people begin to interact with it, shaping how it's used, what materials are explored, and how the space evolves over time. In that sense, a makerspace is always in the making, co-created by the people who use it. As part of *make-a-thek*, the basic setup for a circular makerspace includes a range of different machines. This doesn't mean every makerspace should look the same. Instead, think of it as a shared repertoire, something to pick and choose from depending on the local context, the community, and the needs of its users.

This guide introduces nine machines that the project considers a useful starting point for a circular *make-a-thek* makerspace. It's a first iteration, an entry point rather than a complete manual. Over time, more in-depth and detailed audio-visual guides will be developed and made accessible through the Open Educational Resource on the *make-a-thek* website.

Each section in this guide focuses on one machine. It includes a short introduction, an overview of materials and related tools, and a look at how the machine can be used in a fashion or craft context. You'll also find references to video tutorials or external resources, along with a written step-by-step guide to help you get started.

It's worth saying: this guide won't make you an expert overnight. It's meant as a starting point, a way into the process. Making is something you learn by doing. The more time you spend with the machines and materials, the more familiar they become, and the more confident you'll feel exploring your own ideas.

LASER CUTTER

Laser cutting is a fast, precise, and versatile digital fabrication process used to cut and engrave materials. The machine works by directing a high-power laser beam through a series of mirrors and lenses onto a flat working surface (the laser bed). The laser head moves across the X and Y axes while the material remains stationary. Materials such as **cardboard, MDF, plywood, acrylic, paper, textiles, and some plastics** can be cut, marked or engraved with high precision. Because the laser is digitally controlled, it is ideal for producing **detailed patterns, prototypes, and repeatable parts**.

A laser cutter does not operate alone! It operates as part of a small digital fabrication system and must be connected to several components to work safely and effectively. The required equipment are:

- **Computer** – used to prepare and send the cutting file to the machine
- **Fume extraction system** – removes smoke and potentially harmful fumes
- **Air assist / compressed air** – blows air at the cutting point to improve cut quality and reduce burning
- **Laser cutter machine**

⚠️ **Important:** Always ensure the fume extractor and air assist are turned on before starting the laser cutter.

Laser cutting for fashion and craft
Laser cutting brings a different kind of precision into a making process. Instead of cutting by hand or blade, it uses a focused beam of light to cut or engrave materials with incredible accuracy. In fashion, this opens up a more architectural way of thinking about textiles. Fabrics, leather, or even paper-like materials can be cut into intricate surfaces; perforated, layered, or interlocked. It’s often used for decorative purposes, like creating lace-like effects or precise embellishments, but it can also become structural: pieces that slot together, fold, or build volume without stitching. In craft, the same logic applies. Whether working with paper, wood, or fabric, laser cutting sits somewhere between digital design and physical making, allowing ideas to move quickly from screen to material.

Here is a ***step by step video tutorial*** for the Trotec Laser Cutter by Fab Lab Barcelona | IAAC. Trotec is one laser cutter company, each laser cutter has its own specificities, however the general understanding of how to operate the machine is similar between the brands. We also have a masterclass by Distributed Design on how to Lasercut your own garments.

Laser Cutting Workflow *(summary)*

1. Design your file using vector design software (Illustrator, Inkscape, Rhino, etc.)
2. Prepare the file
3. Set correct line colors for cutting/engraving
4. Adjust line thickness (often 0.001–0.01 mm)
5. Nest the parts to optimize material use
6. Place the material in the laser bed
7. Focus the laser (depending on machine)
8. Turn on extraction and air assist
9. Send the file to the laser cutter
10. Set speed and power
11. Run a small test cut
12. Start the job and monitor the machine

Fabrication process

Laser cutting is primarily a 2D fabrication process, but clever design strategies allow the creation of complex 3D objects. The machine moves along the X and Y axes, while the laser focus represents the Z axis.

- Designing from 2D to 3D
  With the right design techniques, laser cutting can produce; modular assemblies, folded structures, flexible surfaces, kerf-bent shapes, tesselated structures or interlocked joints. The final form depends on your design strategy, materials, and machine settings.

- Design strategies for implementation
  Good design preparation improves both results and material efficiency. The **Kerf** is the width of material removed by the laser beam. Designs must account for kerf to ensure parts fit together properly.
  Tolerances, different materials and machines produce slightly different cut widths. Testing small samples helps determine the correct tolerance.
  Nesting is the process of arranging shapes within the material sheet to maximize material usage and reduce waste.

- 2D Curves for machining
  Laser cutters interpret two types of digital graphics: **vector** and **raster**.
  Vector graphics are used for cutting and line engraving, where the laser follows precise paths defined by lines and curves. Common vector file formats include SVG, DXF, and AI, and the machine traces these lines directly to produce cuts or engraved outlines.
  Raster graphics, on the other hand, are used for image engraving. In this mode, the laser moves back and forth across the surface—similar to how a printer scans—engraving the image line by line. Typical raster file formats include JPG, PNG, and BMP.

⚠️ Never leave a laser cutter unattended while it is operating.

- Machine setting considerations
  The quality of the cut or engraving is determined by the **machine settings**, primarily **power**, **speed**, and sometimes **frequency or PPI (pulses per inch)** depending on the machine. Power controls the intensity of the laser beam, speed determines how fast the laser head moves across the material, and frequency/PPI controls how often the laser pulses while cutting or engraving. The correct combination of these settings depends on the type of material, its thickness, and the power of the laser machine being used. Most makerspaces provide recommended settings tables to help users select appropriate parameters for different materials.

When does it make sense to use a laser cutter?

➔ Laser cutting is particularly useful when you need: fast prototyping precise and repeatable parts, complex 2D shapes, engraved graphics or labels
➔ Typical applications are: product prototypes, textile manipulations, parametrics structures and design, architectural models and more

Other considerations:

- **Maintenance** of the laser cutter: Regular maintenance ensures safe operation and consistent cutting quality. Important tasks include: Cleaning lenses and mirror, checking air assist flow, cleaning the cutting bed, emptying the filters. It is great to have professional support for this!
- **Understanding the mechanics** of a laser cutter: In this Fab Academy documentation you can find a more detailed explanation of Computer Controlled Machining (CAM) and the more technical explanation of a laser cutter.

IMPORTANT: What materials should NOT BE USED:

➔ Leather and artificial leather that contains chromium (VI)
➔ Carbon Fibers (Carbon)
➔ Polyvinyl chloride (PVC)
➔ Polyvinyl butyrale (PVB)
➔ Polytetrafluoroethylenes (PTFE/Teflon)
➔ Beryllium oxide
➔ Any materials containing halogens (fluorine, chlorine, bromine, iodine and astatine), epoxy or phenolic resins

3D PRINTING

3D printing is an additive manufacturing process used to create three-dimensional objects by depositing material layer by layer. The most common type of 3D printing used in makerspaces is Fused Deposition Modeling (FDM), where a thermoplastic filament is heated and extruded through a nozzle that moves along the X and Y axes while the build platform moves along the Z axis. Materials such as **PLA, PETG, ABS**, and **TPU** are commonly used to produce prototypes, functional parts, tools, and design objects.

A 3D printer does not operate alone! A 3D printer operates as part of a digital fabrication workflow and requires several components to function properly. The required equipment includes:

- **Computer** – used to prepare and send the print file
- **Slicing software** – converts the 3D model into printable layers
- **Filament material**

⚠️ **Important:** Always ensure the print bed is clean and level before starting a print.

3D printing for fashion and crafts
In combination with textiles, 3D printing opens up particularly interesting possibilities for fashion and material experimentation. By carefully selecting the properties of the filament and combining them with the behavior of different fabrics, you can create a wide range of effects such as textures, ruffling, flexible structures, and hybrid textile components. Printing directly onto fabric or integrating printed elements with soft materials allows you to explore new relationships between rigid and flexible surfaces. You can explore many applied examples of *computational design* for textiles and fashion in this two-hour lecture from Fabricademy, hosted by Julia Koerner, which presents research and industry applications of 3D printing in fashion. Additionally, 3D printing technologies can be used with clay, bio-based or experimental materials to produce viable alternatives for traditional materials used in product and architectural design. One example is using 3D printing clay for vases, columns or sculptures. Allowing crafts people to explore new material applications and an intricate interplay between emerging technologies and ancestral techniques.

Here is a ***step by step video tutorial*** for how to use Creality Ender 3 Pro 3D Printing Machine by Fab Lab Barcelona | IAAC. We also have a tutorial on how to use biomaterials with the 3D printer, a Masterclass by Distributed Design on craft practices in combination with technologies and one about low-tech 3D printing.

3D Printing Workflow *(summary)*

1. Design a 3D model using CAD software
2. Export the model as STL or OBJ
3. Import the file into slicing software
4. Adjust print settings and supports
5. Slice the model to generate G-code
6. Load filament into the printer
7. Prepare and level the print bed
8. Start the print
9. Monitor the first layers
10. Remove the finished object after cooling

Fabrication process

3D printing transforms a digital 3D model into a physical object by depositing thin layers of material. The nozzle moves along the X and Y axes while the build plate moves vertically along the Z axis. There are many different 3D modeling tools, the most popular ones are Blender, Fusion 360 and Rhino. More information about 3D design processes can be found in the FabAcademy documentation.

- Designing for 3D Printing

  Designing for additive manufacturing requires considering several factors:
  Modeling: 3D printers require files that describe the geometry of the object. The most common file formats used for 3D printing include STL, OBJ, and 3MF. Many ready-to-print models are available online through platforms such as Thingiverse, Git repositories, Wikifactory, or similar open design communities. When designing objects from scratch, it is important to ensure that the model is a closed, watertight surface (often called a manifold model). This ensures the printer can correctly interpret the geometry. The design process can follow different modeling approaches, including mesh modeling, solid modeling, or parametric design, depending on the software and workflow used.
  Wall thickness: Walls that are too thin may break, warp, or fail to print correctly. Increasing wall thickness improves the structural strength and durability of the object, but it also increases material use and printing time. You should carefully consider wall thickness based on the intended function of the object, the properties of the chosen material, and any planned post-processing, such as sanding or finishing.
  Tolerance: Tolerance refers to the clearance between parts that need to fit or move relative to each other. When designing objects with joints, hinges, or interlocking components, a small gap must be included to compensate for material expansion and printing inaccuracies. Testing small samples can help determine appropriate tolerances for a specific printer and material.

- From 3D Model to Printing

  Slicing: Before printing, the 3D model must be processed using slicing software. The slicer converts the 3D geometry into a series of thin layers and generates the toolpath instructions (G-code) that the printer follows.

During this step, the user can adjust printing parameters such as layer height, infill density, print speed, and support structures.
Layer height: Layer height refers to the thickness of each printed layer and directly affects the resolution and surface quality of the print. Smaller layer heights produce smoother surfaces and more detailed prints but increase printing time. Larger layer heights print faster but may result in more visible layer lines.
Resolution and the stepping effect: Because 3D printing builds objects layer by layer, curved surfaces may display a stepping effect, where individual layers become visible. This effect is more noticeable on surfaces with strong curvature. It can be reduced by lowering the layer height or by orienting the object differently during printing.

⚠️ Never leave a new print unattended until the first layers adhere properly.

- <u>Machine Setting Considerations</u>
  Print temperature: Controls how hot the nozzle becomes in order to melt the filament. Different materials require different temperatures to ensure proper extrusion and layer adhesion.
  Print speed: Determines how fast the printer moves while depositing material. Higher speeds reduce printing time but may reduce print quality or accuracy.
  Overhangs and supports: Overhangs occur when a part of the design extends outward without sufficient support from the layer below. Large overhangs often require support structures during printing to prevent the material from sagging or collapsing. These supports can be removed after printing but may leave marks on the surface.
  Shells and infill: When printing objects with volume, it is common to create a shelled structure. This means the outer walls of the object have a defined thickness while the interior is partially filled with a patterned structure known as infill. Infill reduces material consumption while maintaining structural strength. Different infill patterns (such as grid, triangular, honeycomb, gyroid, or wiggle structures) offer different balances between strength, flexibility, and print speed.

When does it make sense to use a 3D printer?

➔ The intersection between crafts and emerging technologies offers exciting opportunities, which can lead to new forms of material expression and hybrid fabrication methods. Throughout the make-a-thek, we encourage this exploration and provide training sessions and educational resources to support skill development.

➔ Using additive manufacturing, such as 3D printing, can reduce material waste compared to subtractive manufacturing processes. However, it is important to consider the purpose and usefulness of the printed object before fabrication. Designing with intention helps to create meaningful objects, functional components, or experimental materials rather than producing unnecessary objects that do not serve a clear purpose.

Other considerations:

- **There are three different types of 3D printing technologies:**
  Extrusion (FDM), as explained above, is the most used technology, it builds parts by extruding lines from solid thermoplastic materials.
  Light Polymerized (SLA), uses a platform submerged in a tank filled with liquid photopolymer resin. Once submerged, a laser maps a cross-sectional area (layer) of a pattern across the bottom of the tank, which solidifies the material.
  Powder Bed (3DP) uses a laser to sinter thin layers of powdered materials, one layer at the time. The platform descends one layer at the time as each cross section of the part is scanned and sintered, solidifying the desired aspects.
- **Maintenance**: Basic maintenance tasks include cleaning the print bed to ensure proper adhesion, checking and leveling the build plate, and periodically cleaning the nozzle to prevent clogs caused by filament residue. It is also important to inspect the extruder mechanism, belts, and moving axes to ensure they are properly tensioned and moving smoothly. Dust and filament particles can accumulate over time, so keeping the machine clean and occasionally lubricating the linear rods or rails helps maintain accurate movement. In addition, users should monitor filament condition—ensuring it is stored in a dry environment to avoid moisture absorption, which can negatively affect print quality.
- **Understanding the mechanics** of a 3D printer: In this Fab Academy documentation you can find a more detailed explanation of additive manufacturing processes and 3D printing in general.

VINYL CUTTER

A vinyl cutter is a digital fabrication machine used to cut thin materials such as adhesive vinyl, paper, or flexible sheets. Instead of using a laser, the machine uses a small blade that moves across the surface following vector paths from a digital design file. Vinyl cutters are widely used for producing stickers, decals, signage, textile graphics, but can also be used to cut copper tape into circuit traces.

Materials

Working with a vinyl cutter is quite approachable in terms of materials, you don't need much, but each element plays a specific role in the process.

- **Vinyl** comes in different types depending on what you want to do.
- **Adhesive vinyl** is used for surfaces like glass, wood, or plastic, it sticks directly without heat.
- **Heat transfer vinyl** (HTV), on the other hand, is designed for textiles and needs a heat press (or iron) to bond with fabric.
- **Cutting mats** holds the material in place while the machine cuts. It has a slightly sticky surface that keeps everything from shifting.
- **Weeding tools** (small hooks, tweezers) help you remove the excess material.
- **Transfer tape** (for adhesive vinyl) is used to move your design onto a surface, or textiles like cotton and polyester (for HTV).

Vinyl cutting for fashion and crafts

Vinyl cutting has been part of the craft and DIY scene for years, quietly becoming more accessible as the machines themselves have dropped in price. What was once specialised equipment is now something you can have on a desk at home for around €300 or less. That shift has opened up a lot of everyday experimentation; but in fashion, its potential still feels only lightly touched. People are, for instance, cutting textiles alongside secondary materials to create intricate shapes. Others use vinyl cutters to produce stencils for screen printing, translating digital designs into repeatable patterns with relative ease.

Here is a ***step by step video tutorial*** for the Roland CAMM-1 GX-24" Vinyl Cutter and the Silhouette Cameo - Vinyl Cutter by Fab Lab Barcelona | IAAC. We also have a step by step tutorial on how to use a vinyl cutter by Fab Academy.

Vinyl Cutting Workflow *(summary)*

1. Design the vector file
2. Load vinyl into the machine
3. Adjust blade depth
4. Send file to the cutter
5. Perform a test cut
6. Start the cutting job
7. Weed excess vinyl

8. Apply transfer tape
9. Transfer the design onto the final surface

Fabrication process
The machine moves along the **X and Y axes** while a small blade cuts the surface of the material without cutting through the backing layer.

- File preparation
  Your vinyl cutter files must contain only vectors.
  The vectors must be lines only, with no fill.
  The vinyl cutter drivers can only interpret cut lines.
  All vectors must be contained within the bounds of the document canvas.

- Document Setup
  You will need to size your page in your drawing program appropriately for the width of vinyl that you are using. Vinyl comes in two widths, 24" and 15".
  Wide Vinyl (24")
  Machine rollers will take up 1" on either side of the vinyl.
  Set Document Width to 22"
  Set Document Height to a minimum of 23"
  Narrow Vinyl (15")
  Machine rollers will take up 1" on either side of the vinyl.
  Set Document Width to 13"
  Set Document Height to a minimum 14".

⚠️ the document height is must be larger than the document width. If the width is larger than the height, the machine may rotate your design by 90 degrees.

- Loading the Vinyl
  Select a roll of vinyl and place it on the rollers behind the machine.
  On the back right of the machine you will see a lever; place it in the "down" position so you can load the vinyl.
  Make sure the vinyl side is facing up as you feed it through the rollers.
  Under the rubber wheels there is a white sticker indicator.
  Ensure that the vinyl is aligned properly under the rubber wheels.
  The left wheel must always be under the wide white sticker on the left.
  The right rubber wheel must be under any one of the three white stickers on the right, depending on the width of your vinyl.
  Make sure your vinyl is straight and about 2-3cm past the rubber wheels.
  After inserting the vinyl into the machine, pull up the lever at the back of the machine to ensure that the vinyl is securely loaded.

When does it make sense to use a vinyl cutter?

➔ There are a variety of practical and exploratory practices and applications for vinyl cutters. One interesting application is in combination with heat press to create transferable designs on textile. The vinyl cutter also allows you to create designs for screenprinting.

HEAT PRESS

A heat press is a machine used to transfer graphics onto textiles or other surfaces using heat and pressure. It is commonly used with heat transfer vinyl (HTV), sublimation prints, or transfer papers. The machine consists of two heated plates that apply controlled temperature, pressure, and time to permanently bond the design to the material.

Materials

You don't need a huge toolkit or material library to get started; just a few key materials that each bring something different to the process.

- **Cotton textiles** are probably the easiest place to begin. They're forgiving, handle heat well, and tend to give consistent results.
- **Polyester fabrics** open up other possibilities, especially for sportswear or more technical garments. They can be a bit more sensitive to heat.
- **Heat transfer vinyl (HTV)** is where things get interesting. It's a thin material with an adhesive backing that reacts to heat. It comes in all sorts of finishes—matte, glossy, textured, even reflective.
- **Transfer paper** is often used when working with printed designs. Instead of cutting shapes out, you print your design and then transfer it onto fabric using heat.

Each of these materials carries its own feel and limitations. Part of the process is learning how they respond; how they stretch, how they bond, how they age.

Heat press and Fashion

At its core, the heat press allows you to translate digital or hand-made designs directly onto fabric. That alone makes it powerful: it shortens the distance between idea and outcome. You can sketch something in the morning and be wearing it by the afternoon. In fashion, this opens up a few interesting directions. It's often used for customisation—adding graphics, text, or patterns to existing garments. But it can also support more experimental approaches, like building layered surfaces, combining materials, or creating modular designs that can be updated over time. What's still unfolding is how this tool might shape not just decoration, but construction and thinking in fashion. Instead of stitching everything, could some elements be bonded? Instead of fixed designs, could garments stay adaptable? The heat press doesn't answer these questions; but it makes them possible to explore.

In the context of Fabricademy, the heat press is being used to explore soft robotics. Heat is applied to "weld" areas of textiles together using adhesive layers. With the addition of a pump and simple electronics, these sealed sections can then be filled with air, forming chambers that expand into interesting three-dimensional shapes for fashion design. ***A guide and reference materials*** for developing soft robotics can be found here through the Fabricademy website. A ***step by step guide*** for using the heatpress can be found on Instructables.

Laser Cutting Workflow

1. Prepare the design
2. Cut design with a vinyl cutter (if using HTV)
3. Preheat the heat press
4. Place the textile on the press bed
5. Position the transfer material
6. Press according to recommended settings
7. Allow the material to cool or peel depending on instructions

Fabrication process

Start by creating or selecting your design. If you're using heat transfer vinyl, cut your design (usually mirrored) and weed out the excess material, leaving only what you want to transfer. At the same time, make sure your fabric is clean and flat, wrinkles or dust can affect how well the material sticks.

- Heat press set up:
  Turn on your heat press and adjust the temperature, pressure, and time. These three settings are key, and they always depend on the combination of fabric and transfer material you're using. Place your fabric on the heat press base and smooth it out. Then carefully position your design on top, adhesive side down.
- Processing and finish:
  Close the heat press and let it do its work. Heat and pressure activate the adhesive layer, bonding the transfer material to the fabric. After completion, open the press and follow the instructions for your material; some require a hot peel, others need to cool down before removing the backing. Peel carefully and check that everything has adhered properly. If needed, you can press it again briefly to secure it. Even though the design is now attached, it's a good idea to let the fabric rest for a bit before wearing or washing it. This helps the bond fully set and improves durability over time.

⚠️HOT HOT HOT ! As the name suggests, a heat press works by applying heat. It's important to keep safety in mind: children should always be supervised, protective gear such as heat-resistant gloves is recommended, and care should be taken to avoid any direct contact between skin and the heated metal parts.

When does it make sense to use a heat press?

➔ The process is quite straightforward, but it's also sensitive. Small changes in heat, pressure, or timing can shift the outcome. This is all part of the learning, prototyping and skill building.
➔ Typical applications are: Custom clothing, textile graphics, sportswear customization, small-batch merchandise production

SEWING MACHINE

A sewing machine is used to join fabrics and flexible materials together using thread and a needle. Modern sewing machines allow users to perform different stitches for construction, finishing, and decorative purposes. Sewing machines are widely used in textile prototyping, fashion design, and soft product development.

Materials
The materials you use will shape both the process and the outcome, so it's worth getting familiar with a few basics.

- **Fabrics** Cotton is a good starting point—stable and easy to handle. From there, you might explore denim, linen, or more delicate fabrics like silk. Each behaves differently under the needle.
- **Thread** Standard polyester thread works for most projects, but different threads (cotton, nylon, thicker decorative ones) can change both strength and appearance.
- **Needles** Not all needles are the same. Heavier fabrics need stronger needles, while lighter fabrics need finer ones to avoid damage.

Additional elements: Interfacing, elastic, or even non-textile materials can be introduced if you want to experiment.

Sewing for fashion and craft
Sewing machines have been around for a long time, evolving from hand sewing into something faster, more precise, and widely accessible. They're often associated with traditional garment making; and of course, that's still at the core. But lately, there's been a shift. More and more designers are using sewing machines not just to assemble clothes, but to experiment with how textiles behave and how garments come together. You see this in unexpected stitch patterns, in layered constructions, in fabrics being manipulated as much as they are joined. Stitching becomes more than a seam; it becomes texture, structure, sometimes even decoration in itself. The machine, in that sense, is not just a tool for finishing things, but for thinking through making.

Here you can find a ***step by step video tutorial*** for a sewing machine by *craftsy*. *Viva lab* developed a basic tutorial, for the *shemakes* project, on how to use the sewing machine to make a tote bag. We also have a **step by step guide** for pattern making by Fabricademy, developed by Aldana Persia. And in case you are interested in learning Clo3D, which is a pattern making software, then check out this Fabricademy **video tutorial**. There are in total six classes which you can find here.

Sewing Workflow *(summary)*

1. Prepare the fabric pieces
2. Thread the machine
3. Wind and insert the bobbin
4. Select stitch type
5. Position fabric under the presser foot
6. Lower the presser foot
7. Start sewing slowly
8. Guide fabric evenly
9. Secure seams with backstitch

Fabrication process

The machine drives a needle through the fabric while thread from the bobbin forms a **lockstitch**, joining layers of fabric together.

- Machine set up
  Start by threading the machine correctly. The top thread runs from the spool through a series of guides and down through the needle, while the bobbin sits below, providing the second thread. Together, they form what's called a *lockstitch*—the needle drives the top thread through the fabric, and the bobbin thread loops around it to hold everything in place. Before you start sewing, make sure your fabric pieces are aligned and smooth. Place them under the presser foot, which holds the material steady while the feed dogs (small teeth under the fabric) move it forward. This is what creates an even stitch without you having to pull the fabric yourself.
- Machine settings
  Set your stitch length, thread tension, and choose the right needle type for your material. These settings can completely change the outcome. A longer stitch might feel looser and more visible, while tighter tension creates a more secure seam.
- Sewing and finishing
  Lower the presser foot and gently press the pedal. Let the machine guide the fabric while you focus on direction rather than force. Try to keep a steady pace, too fast or too slow can affect stitch consistency. It takes a bit of practice to find that rhythm. At the end of your seam, use a backstitch (sewing a few stitches in reverse) to lock everything in place. This prevents the thread from unravelling. Then lift the presser foot, remove your fabric, and trim the threads.

When does it make sense to use a sewing machine?

➔ In the *make-at-thek* context, where repair and circularity matter, the sewing machine is one of the most practical tools you can have. It allows you to extend the life of garments, reinforce worn areas, or completely transform pieces instead of discarding them.

➔ Typical applications range from garment construction, to soft prototyping, where you quickly test ideas in fabric before refining them.

OVERLOCK

An overlock machine, also known as a serger, is used to finish fabric edges and create durable seams. It uses multiple threads and loopers to stitch over the edge of the fabric while trimming excess material. This machine is commonly used in garment production to create clean, stretchable seams.

Materials

Overlock machines work best with materials that benefit from flexibility and clean edges.

- **Stretch fabrics** like jersey or knit are ideal, they move with the stitch rather than against it.
- **Woven fabrics** can also be used, especially for finishing raw edges.
- **Thread cones** are typically used instead of small spools, as overlock machines require multiple threads at once.
- **Decorative threads** can be introduced if you want to highlight the seam rather than hide it.

Overlock for fashion

Overlock machines (or sergers) are often seen as a finishing tool. They're great for creating clean edges and preventing fabrics from fraying, but they also open up a different way of constructing garments, especially when working with stretch materials. In contemporary fashion, overlocks are increasingly used not just to finish seams, but to define them. Exposed seams, contrasting threads, and raw-edge aesthetics all come into play. What was once hidden inside a garment is now sometimes brought to the surface as a design feature. It's fast, efficient, and surprisingly expressive when used beyond its traditional role.

Rosery Apparel made a ***step by step video tutorial*** on how to use an Overlock. full introduction Julija Gobere has some great additional tips and tricks for how to use an overlock on youtube. The sewing machine company Bernina, is providing a ***step by step guide*** on how to use the machine on their website.

Overlock Workflow

1. Thread the machine correctly
2. Adjust tensions
3. Place fabric under presser foot
4. Start stitching slowly
5. Guide fabric along the blade edge
6. Trim and finish seams

Fabrication process

Overlock machines use multiple threads (usually 3–4), which makes threading a bit more complex than a regular sewing machine. Each thread follows a specific path, looping together to form a strong, flexible stitch.

- Preparing the fabric
  Place your fabric so that the edge lines up with the machine's cutting blade. One unique feature of an overlock is that it trims the fabric as it stitches, creating a clean edge in one continuous motion.
- Settings and stitching
  Set your thread tension, stitch length, and differential feed (if available). These settings control how the fabric moves and stretches. For example, adjusting the differential feed can prevent puckering or create intentional gathers. Lower the presser foot and begin sewing. The machine will simultaneously cut, stitch, and finish the edge. Guide the fabric gently—there's no need to push or pull. The rhythm here is slightly different from a sewing machine, faster and more fluid.
- Finishing
  At the end, let the machine run slightly past the fabric edge to create a thread chain. This can be trimmed or tucked in to secure the seam. The result is a neat, durable edge that resists fraying.

When does it make sense to use an overlock?

➔ Typical applications include (professional) seam finishing, where raw edges are neatly enclosed to prevent fraying, and working with stretch fabrics like jersey, where the seam needs to move with the body rather than resist it. It's also widely used in garment assembly, particularly for pieces like t-shirts, activewear, and underwear, where comfort and durability matter.

EMBROIDERY MACHINE

An embroidery machine is a digitally controlled sewing machine that stitches decorative patterns onto fabric. The machine follows digitized embroidery files to automatically stitch complex designs.

Materials

Working with an embroidery machine doesn't require a huge list of materials, but the few you use really matter.

- **Fabric** cotton is a great starting point, but you can also work with denim, linen, silk, or even more technical textiles depending on the effect you want.
- **Embroidery thread** is usually slightly shinier and more decorative than standard sewing thread. It's what gives embroidery its visual richness.
- **Stabilizer** This sits behind (or sometimes on top of) the fabric and keeps everything in place while the machine stitches. Without it, the fabric can shift or pucker.
- You'll also use an **embroidery hoop**, which holds the fabric tight and allows the machine to move it precisely.

Embroidery machine for fashion and crafts

Embroidery has a long and rich history across many cultures; used to decorate, tell stories, signal identity, and add meaning to textiles. From hand-stitched traditions to highly detailed ceremonial garments, it has always been both craft and expression. What embroidery machines do is extend this tradition into a more digital and scalable space, without losing that sense of detail and care. In fashion and craft today, embroidery machines allow designers to work somewhere between heritage and innovation. You can recreate traditional patterns, remix them, or generate entirely new ones through digital tools. It becomes possible to produce intricate designs quickly, repeat them, or personalise them at scale. At the same time, embroidery still carries a tactile quality, it sits on top of the fabric, adding texture and depth.

In the community section of the Bernina (a sewing machine company) website, you can find a ***step by step guide*** on how to set up your files for the embroidery machine by Kay Hickman. Youtuber, *Embroidery Legend*, has a 15 min ***step by step video tutorial*** for how to use an embroidery machine.

Embroidery Workflow

1. Prepare the embroidery design
2. Digitize or import the file
3. Hoop the fabric with stabilizer
4. Load the design into the machine
5. Thread the machine
6. Start stitching
7. Trim threads and remove stabilizer

Fabrication process
The machine moves the embroidery hoop in the X and Y axes while the needle stitches the programmed design.

- From design to set-up
  Embroidery starts digitally. Designs need to be in specific formats like DST, PES, or EXP, and they must be *digitized*—which means translating an image into stitch instructions. This step defines how the machine will move, where stitches go, and in what order. It's less about drawing and more about planning how thread will behave on fabric.
  Choose your **thread type,** adjust settings like stitch density, and select the right hoop size for your design. Then prepare your fabric by adding a stabilizer and placing it tightly in the hoop.
  Attach the **hooped fabric to the machine**. Make sure to add a stabilizer backing depending on which fabric you are working with. The embroidery machine works by moving the hoop in the X and Y directions while the needle stitches up and down. This means the fabric itself is in motion, not just the needle.
- Stitching process
  Once everything is set, start the machine and let it run. You'll see the design gradually appear as layers of stitches build up. It's a bit like watching a drawing being constructed line by line, but in thread. It's mostly automated, but still worth observing in case adjustments are needed.
- Finishing
  When the stitching is done, remove the hoop and carefully take off the stabilizer. Trim any loose threads and check the design. At this point, the embroidery is fully integrated into the fabric.

When does it make sense to use an overlock?

➔ An embroidery machine makes the most sense when you want to add detail, identity, or texture to a textile in a way that feels integrated rather than applied on top.

➔ In the context of make-at-thek, where repair, reuse, and circular thinking come into play, it can also be used to personalise or refresh existing garments, giving them new value instead of replacing them.

➔ Typical applications include custom garments, where embroidery adds a unique touch; logos and branding, especially when consistency matters; and decorative textiles, where surface detail becomes the main focus. It's also widely used for personalised products—small batches or one-offs that carry a name, symbol, or story.

SCREEN PRINTING

Screen printing is a technique used to transfer ink onto a surface through a mesh screen stencil. The stencil blocks areas where ink should not pass through, creating the printed design. This process is widely used for textile printing, posters, and graphic production.

Materials

- **Mesh screen** a frame with a fine mesh stretched across it; this is where your design lives and where the ink passes through.
- **Emulsion or stencil** used to block out areas of the screen so that ink only goes where you want your design to appear.
- **Ink** specially made for screen printing; it can vary in thickness, opacity, and finish depending on the effect you want.
- **Squeegee** a flat tool used to push the ink evenly across the screen.
- **Printing surface** this could be fabric, paper, or other flat materials where the design will be transferred.

Screen printing for fashion and crafts

Screen printing is one of those techniques that sits comfortably between craft and production. It's been used for decades in fashion, art, and graphic design because it's both repeatable and hands-on. At its core, it's about pushing ink through a screen to transfer a design onto a surface, but the way you do that can vary a lot. You can keep it clean and consistent, or lean into imperfections, layering, and experimentation. That balance makes it especially interesting in fashion, where it can be used for bold graphics, subtle textures, or even storytelling across garments.

Youtuber, *ProperFit Clothing Co*, has a 15 min ***step by step video tutorial*** for how to screenprint. Both *Bre* and *Pigskins and Pigtails*, ***step by step video tutorial*** on youtube, for how to use a Circuit Vinyl cutter for screen printing. Which is a great alternative to the traditional screen printing technique with UV sensitive emulsion. There are some designers who use a collage, or layering, technique to combine screenprinting with embroidery. Which is a great example for a mixed method approach.

Screenprinting Workflow

1. Prepare the artwork
2. Create a stencil on the screen
3. Expose the screen using light
4. Wash out the design
5. Position the material
6. Apply ink on the screen
7. Pull ink with the squeegee
8. Lift the screen
9. Cure or dry the print

Fabrication process
Ink is pushed across a mesh screen using a squeegee, transferring the design onto the material below.

- Preparation and stencil making
  Start with your design. It needs to be clear and high-contrast, as it will define where ink passes through the screen.
  Coat the mesh screen with emulsion or apply a stencil. This layer will block certain areas of the screen, leaving other parts open for ink to pass through.
  Place your design on the coated screen and expose it to light. The exposed areas harden, while the covered areas remain soft. This step transfers your design onto the screen in a physical way. Rinse the screen with water. The soft, unexposed emulsion washes away, leaving open spaces in the shape of your design. Now the screen is ready to print.
- From Design to printing
  Lay your fabric or paper flat under the screen. Alignment matters here, especially if you're printing multiple items or layers.
  Add a line of ink at one edge of the screen. Using the squeegee, pull the ink across the screen with even pressure. The ink is pushed through the open mesh areas and transferred onto the material below. Carefully lift the screen to reveal the print.
- Cure or dry the print
  Let the print dry or use heat to cure it, depending on the ink type. This step ensures the design is set and durable over time.

When does it make sense to use screen printing?

➔ Screen printing is great when you want to produce multiple versions of the same design while still keeping a hands-on, craft-based process. It supports small-scale production without losing that sense of making.

➔ Typical applications include textile printing, poster production, art prints, and graphic designs.

SOLDERING STATION

A soldering station is used to join electronic components by melting solder, a metal alloy that creates an electrical connection between parts. It is essential for electronics prototyping, circuit assembly, and repair.

Materials

Soldering requires a small set of tools and materials:

- **Soldering iron** which heats up to melt the solder and create connections.
- **Solder wire** a metal alloy (often with a flux core) that melts and then solidifies to form a conductive bond.
- **Flux** helps the solder flow more smoothly and improves the quality of the connection.
- **Sponge or brass cleaner** used to clean the tip of the soldering iron, keeping it effective and precise.
- **PCB (Printed Circuit Board) and/or electronic components** optional, depending on your project; these are what you connect together.

Screen printing for fashion and crafts

Soldering might seem like it belongs purely to electronics, but it's increasingly finding its place in fashion, especially where textiles meet technology. In areas like e-textiles, wearables, and soft robotics, soldering becomes a way to connect components, build circuits, and bring interactivity into fabric-based work. What's interesting is how this shifts the idea of what a "textile" can be. A garment is no longer just passive, it can respond, light up, move, or sense. It's not about replacing one with the other, but about finding ways they can coexist, soft materials with hard components, craft with code.

We at *Fab Lab Barcelona* have an **extensive repository** about electronics design and production as part of *Fabacademy*, which you can find here. This **video tutorial** explains soldering in detail. Beyond the introduction to solder, Emma Pareshi documented the Fabricademy **class materials** on how to develop e-textiles. E-textiles is the integration of electronic components in textile, mainly in the fashion sector. *Liza Stark*, another *Fabricademy* instructor, has a **documented class** on wearables. *Lara Grant* also developed an *Instructable* detailed ***step by step guide***, in which she gives an introduction to conductive textiles. The *Shemakes* project provides various **beginner friendly tutorials** for kids and young adults on how to develop projects that integrate textiles and electronics.

Soldering Workflow

1. Turn on the soldering station
2. Set the appropriate temperature
3. Clean the soldering tip
4. Place the component on the board
5. Heat the joint with the iron

6. Apply solder to the joint
7. Remove the iron and allow solder to cool
8. Inspect the connection

Fabrication process
A heated soldering iron melts solder onto a joint where it cools and solidifies, creating a conductive bond.

- Soldering set up
  Switch on the soldering iron and let it heat up. This usually takes a few minutes. It's a good moment to prepare your components and workspace so everything is within reach. Adjust the temperature depending on what you're working with. Too low, and the solder won't melt properly; too high, and you risk damaging components or materials.
  Before you start, **clean the tip** using a damp sponge or brass cleaner. A clean tip transfers heat more efficiently and gives you better control over the solder.
- Soldering
  Position your electronic components where they need to be. This might be on a PCB or integrated into a textile setup, depending on your project.
  Touch the soldering iron to the point where the component and surface meet. The goal is to **heat the joint** itself, not the solder directly.
  Once the joint is hot enough, **feed the solder into it**. The heat will melt the solder, allowing it to flow around the connection. The heated iron melts the solder, which then cools and solidifies to form a conductive bond.
  Take the iron away and let the **solder cool naturally.** It should solidify quickly into a smooth, shiny connection. A good solder joint is usually clean and slightly glossy. If it looks dull or uneven, it might need to be reheated and adjusted.

Machine settings
Temperature control is important and typically ranges between 320–380°C depending on the solder type.

⚠️ Always work in a **well-ventilated area and avoid touching the heated tip**.

When does it make sense to use a soldering iron?

➔ Soldering makes sense when your project moves beyond purely physical making and into interaction, responsiveness, or electronics.
➔ Typical applications include wearable electronics, interactive garments, soft robotics prototypes, and sensor-based textiles.