TSL

Part of WF Education Group

Laser Cutter Buying Guide

The ultimate guide for education

Introduction

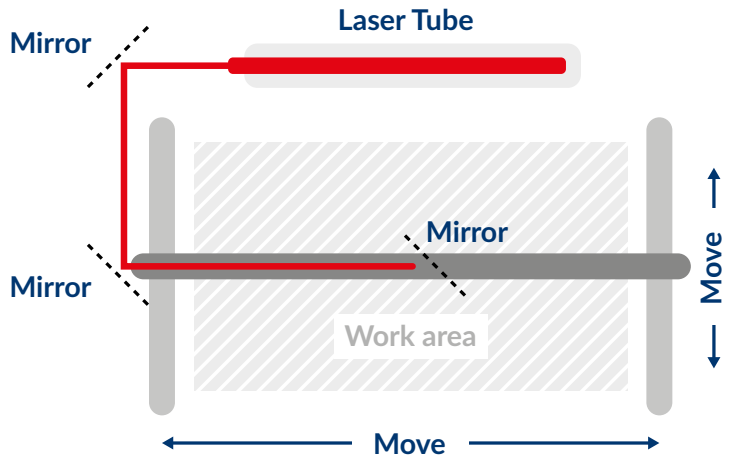
Laser cutters are a great addition to a D&T workshop, encouraging students to familiarise themselves with different manufacturing techniques and how to combine multiple materials and components within finished products. A laser cutter is a significant investment, so this guide is designed to help you make an informed decision based on your requirements. It covers the key features you need to consider when looking through all of the available laser cutters on the market today.

What is a laser cutter?

Laser cutting is a technology that uses a laser to cut and engrave materials. Due to its widespread use in industrial and commercial environments, it has become widely adopted in education over the last 15 years.

How does it work?

The laser beam is generated by 'exciting' CO2 gas within a laser tube by electrical discharge. As the gas is excited, the beam is reflected internally by a mirror, until it achieves sufficient energy. Mirrors direct the coherent light to a lens, which focuses the light at the work area, enabling the laser cutting operation.



Schematic top view laser cutter

What can your students make with a laser cutter?

Introducing a laser cutter allows your students to explore new technologies and a wide variety of techniques and materials to produce some amazing work. Much used in industry, it's an excellent way to get students thinking about these technologies and the outputs they can create – with a little creativity! The below list includes a few ideas, but the only limit is imagination when it comes to the range of things that can be done on a laser cutter, from cost-effective materials to the funkiest product development around. Inspire your students with 21st Century technology and industry favourites by making their designs come to life with a laser cutter.

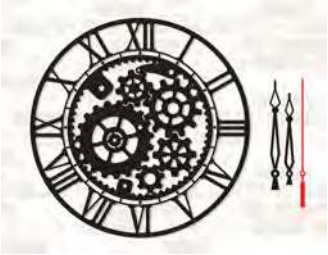
Cardboard Based Projects - Recycling cardboard such as cereal boxes and pizza boxes is a great way of creating excellent projects on a smaller budget.

Lighting Projects - Excellent for engraving and cutting a range of materials to bring your students innovative lighting projects to life.

Storage Solutions - From a simple storage box and magical treasure chests to toolboxes and complex storage furniture. Let your students' imaginations do the thinking and work out how to bring their designs to life.

Prototyping - From the prototyping of miniature furniture, newly designed buildings to statues, bridges, and other iconic landmarks. The laser cutter will help students use their imagination and a range of techniques to prototype endless options for their projects.

Clocks - A somewhat 'timeless' and much-loved project for school children learning Design & Technology. Again, using a range of materials and techniques and learning the mechanics of the traditional 'clock', students will have fun designing and making these with the laser cutter.



Useful holders - From mobile phone holders to headphone stands, why not get your students thinking about how they can make their technological devises better secured, and even enhance usability!?

Why not try a range of techniques:

- ✓ Finger joints
- ✓ Living hinges
- ✓ Engraving

Although the favourite materials for cutting in school are MDF, Acrylic, Cardboard and Plywood, many materials can be cut or engraved using a laser cutter. Here are some that are safe and widely used in schools...

Take a look at TSL's range of laser cutter projects and files, FREE to download...

Night light project – blog.wf-education.com/night-light-project

Living hinge project – blog.wf-education.com/living-hinges-project

Try a range of materials to cut and engrave:

- ✓ Wood – natural timber and especially MDF and Plywood
- ✓ Cork
- ✓ Acrylic
- ✓ ABS
- ✓ HIPS
- ✓ HDPE
- ✓ Paper
- ✓ Cardboard
- ✓ Leather
- ✓ Cotton
- ✓ Polyester
- ✓ Glass (engrave only)
- ✓ Slate (engrave only)
- ✓ Painted metals i.e. anodised aluminium (engrave only)

Glass tubes and metal tubes

Which type should you choose?

Laser cutters can be loosely put into two camps: those powered by glass tubes and those powered by metal tubes. Each method offers its own advantages and disadvantages. Glass tube machines are cheaper to purchase and are seen as an economical solution to laser cutting. The downside is that the glass tube doesn't last as long as its metal counterpart and will need replacing much sooner.

The lifespan of a high-end glass laser tube can be 8,000 hours of use, while smaller, cheaper glass tubes may last as little as 2,000 hours. In comparison, metal tubes can last up to 40,000 hours of use. So although glass tubes are cheaper to replace, you could do this up to 20 times during the life of a metal tube.*

Hybrid laser cutters are available, which use both types of tube, allowing you to cut a variety of materials but also engrave at high quality.

Glass tube	vs	Metal tube
✓ Cheaper initial cost		✓ Tube will last much longer
✓ Many machines using glass tubes are currently available on the market		✓ Lower wattage machine are much more capable
✓ Cheaper to replace the tube		✓ Industrial-quality machines
✓ Large work areas available		✓ No additional chillers required as the tube is air-cooled
		✓ Power depletion is gradual
		✓ Quicker more accurate engraving
		✓ Large work areas available
✗ Tube doesn't last as long		✗ Higher initial cost
✗ Power depletion is instant		✗ Tube replacement is more expensive
✗ Manufacturer support can be an issue		
✗ Quality is not the same as higher-end metal tube lasers		
✗ Requires an additional chiller unit to cool the tube		

*Based on the estimated lifespan provided by tube manufacturers.

Laser power

The same power does not mean the same cutting capabilities!

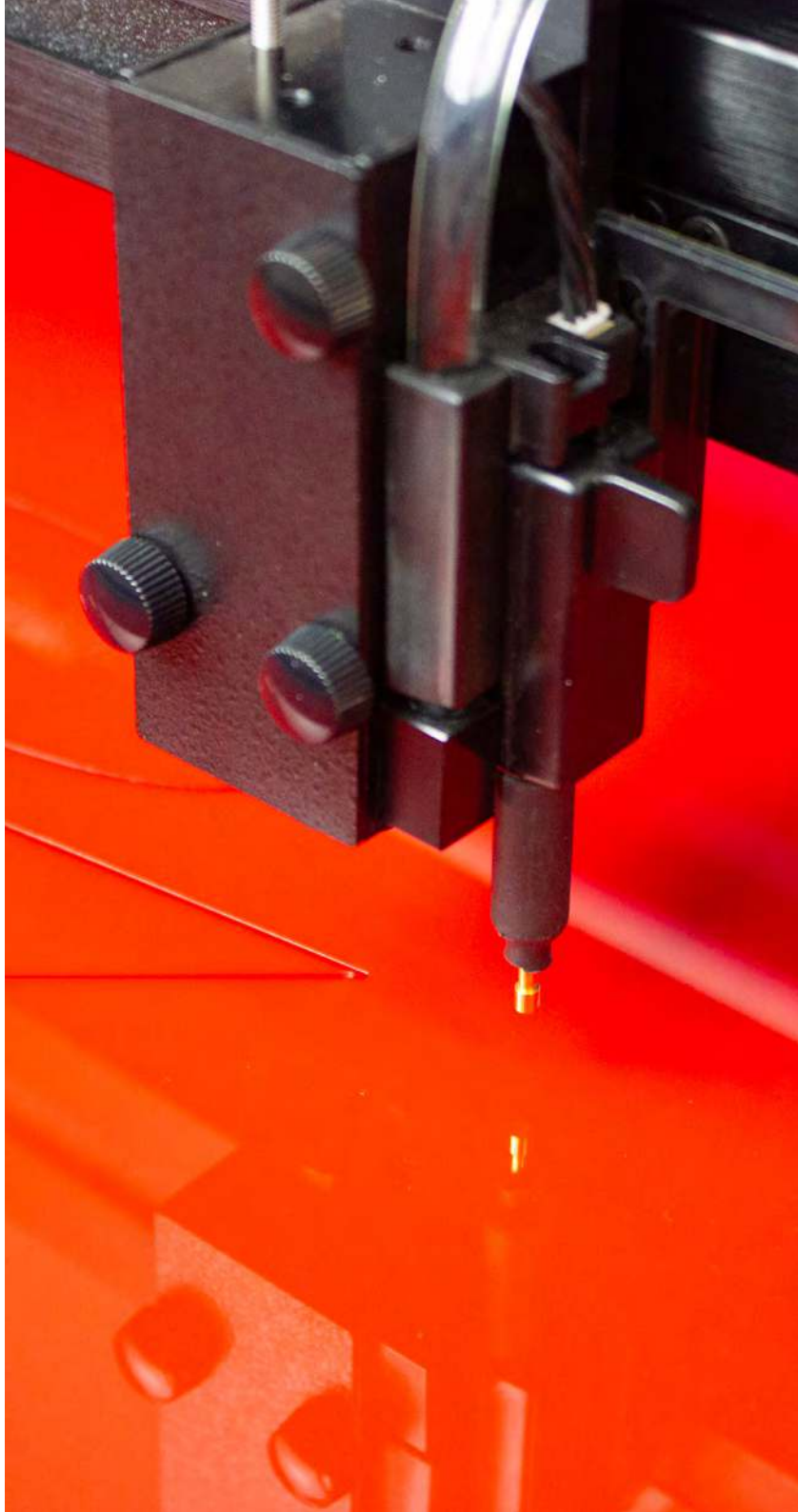
It can be tempting to use the power rating of a laser cutter as a direct comparison between machines and manufacturers, a bit like a horsepower rating, but this isn't necessarily correct.

Cutting capabilities will not be the same from a glass tube machine to a metal tube machine with the same power tube. The glass tube will end up working similarly to a much lower-powered metal tube machine, as a metal tube requires much less wattage to perform the same tasks as a glass tube.

TOP TIP!

Even comparing machines with the same tube type across manufacturers can vary.

This is due to the quality of the mirrors and lenses, as well as the overall build of the machine. Remember, use your own materials on each demonstration to give you a direct comparison between different suppliers' machines.



Bed size

What size laser cutter do you really need?

Consider how you will use your laser cutter. Bed sizes range from A4 up to A0. Bigger bed sizes can be more costly, so it is good to get the biggest bed size you can afford but without compromising the overall quality of the machine you go for, taking into consideration that there will be a slight reduction in cutting capability on the extremes of the bed. Remember, you can't increase your bed size in the future without buying another laser cutter. Consider material buying sizes to reduce wastage.

TOP TIP!

When cutting out work for a whole class, consider 'nesting'.

This means moving components into all of the available material space to ensure you get the most out of your bed size and your material, reducing set-up time between projects.

Extraction

Extraction isn't an option – it is a requirement

Various materials commonly used with a laser cutter produce fumes when being cut and engraved. All fumes should be efficiently extracted from the laser through a suitable extraction system. If no extraction is used, the fumes are a health risk and will also affect the running of your laser cutter.

Look out for the following in your extraction unit

Various Are you looking to ventilate externally? Or are you considering a filtered extraction system? We recommend a filtered extraction because they are easier to use, more portable and are less expensive

- ✓ You will need an air compressor (ideally built-in) used for air assist (your primary fire-prevention system, blowing a variable flow of air onto your workpiece as it's being cut)
- ✓ Filter-monitoring system
- ✓ Interlocked with laser – your laser should only turn on when the extraction is also on.

How often filters are changed depends on how often the machine is used and with what materials. As a rule, though, the average use in education would mean you should budget for new filters every 12 months.
Some laser cutters are supplied with a simple blower fan and a hose to vent fumes through a wall or window. This is not an adequate filtered extraction system and isn't recommended for use in a school. Ensure your extraction system is BS4163:2014 compliant.

Browse our range of extraction units

REMEMBER!

Someone, maybe you, is responsible by law for the health of the students and employees around you and you must take adequate steps to control substances that are hazardous to health. This is according to HSE258 guidelines and code of practice.

TOP TIP!

Look out for additional safety features

Check for features such as an auto cut off, which ensures that the connected laser cutter won't start if the extraction system isn't switched on. Intelligent software built into the extractor can accurately tell you when filters need to be replaced, increasing the efficiency of your laser and extractor.

Space and access

Make sure you have room

Laser cutters vary in size from small desktop machines to larger floor-standing industrial machines. When considering which laser cutter to go for, it's important to think about the physical space in which it will be situated and consider the following:

- Getting the laser cutter through a standard doorway
- Obstacles such as stairs
- Separate chiller and extraction units
- Positioning it approximately 30cm from a wall
- Positioning it away from heat sources
- Ensuring you can easily access parts for maintenance

TOP TIP!

Laser cutters are big machines, so carefully consider where you want yours sited.

It may not be that easy to move the laser cutter once it is in place. Note that some suppliers may need to dismantle parts of the machine to get them through doors and up stairs, which may incur an extra cost.

Software

Is your software compatible?

Most laser cutters are compatible with many popular 2D drawing packages. Check if your current software is compatible by asking the following questions:

- Does the software produce vector line drawings, and can you modify the width and colour of lines?
- Can it handle 'bitmap' images, which are used for raster engraving?
- Can the software output through a printer driver?
- Does the software allow you to nest drawings, optimising your laser-cutting processes?
- The laser should point directly from the software, without the need to go through 3rd party intermediary software.

Popular software includes

- CorelDRAW
- 2D Design
- Serif DrawPlus
- Adobe Illustrator

TOP TIP!

Ensure you are comfortable with how the laser cutter outputs from your software.

Are you limited to using a proprietary piece of software, where you have to produce your designs in another program and then import them to output to the laser? This can add to production time and compromise your designs. During their demonstration, ask the supplier to use the same software that you use in your school or college.

Other features

There are various other features and additional accessories that you should consider when looking at laser cutters.

Autofocus feature

This accurately focuses your material by moving the bed height up and down towards the beam, ensuring the best cut and engrave.

Rotary attachment

This allows you to cut and engrave cylindrical parts such as glasses. It is often an optional extra.

Servo motor

This is a higher-quality motor option that significantly improves the speed and accuracy of cuts and engraves.

Interlock system

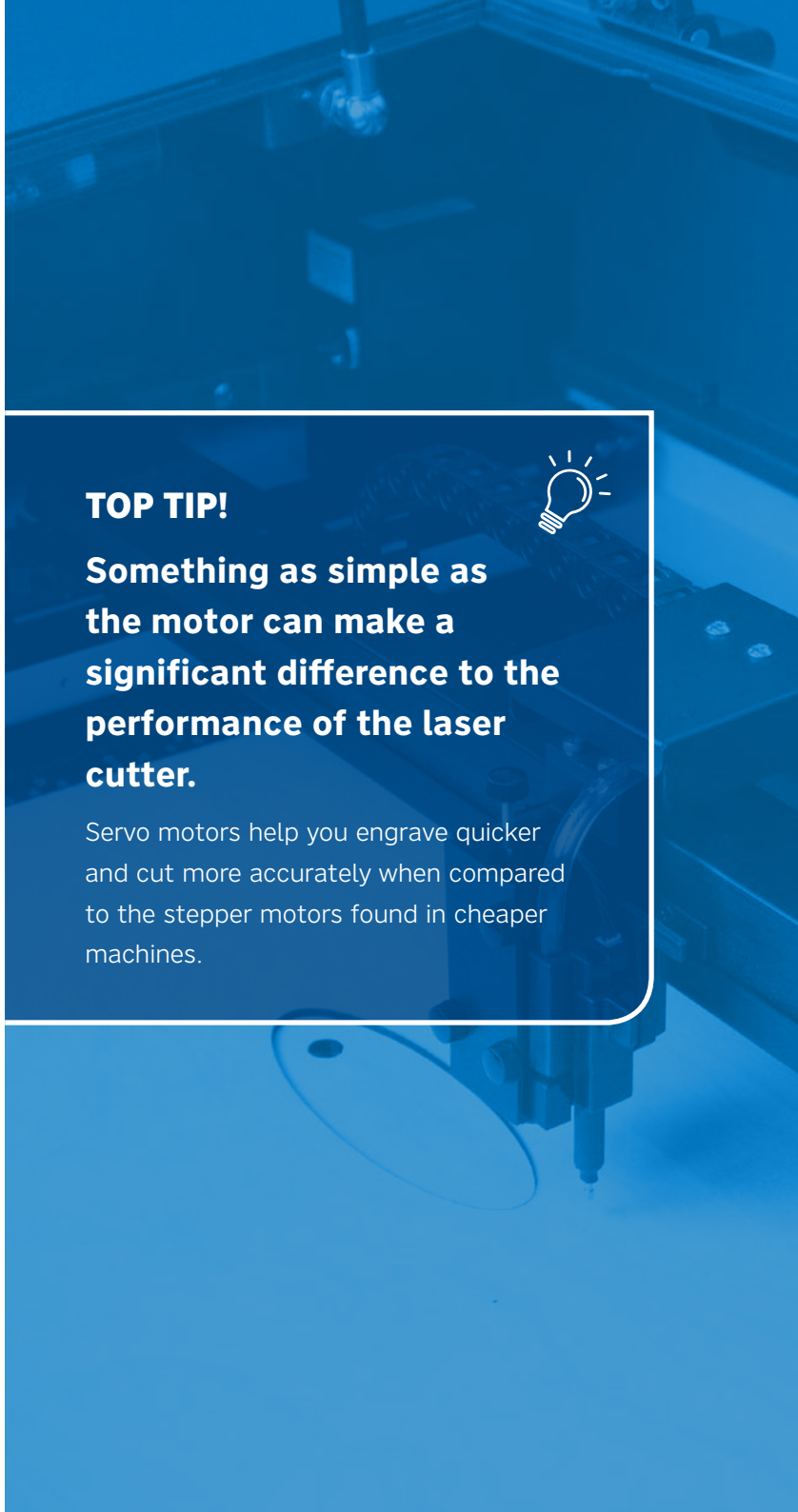
This ensures the laser beam will not fire, unless safe to do so.

Air assist

This provides a constant and variable air flow to your workpiece, extinguishing small fires before they spread.

Fire-detection systems

This is a system such as SmartGuard, which drops the bed and moves the laser head in the event of a fire, reducing damage to your machine.



TOP TIP!

Something as simple as the motor can make a significant difference to the performance of the laser cutter.

Servo motors help you engrave quicker and cut more accurately when compared to the stepper motors found in cheaper machines.

Financials

Packages and deals

What do you get for your money?

With a high initial cost and some additional equipment requirements, it's important to be clear on what is included in the advertised price. Some suppliers will advertise an attractively low price – in most cases, this is just for the laser cutter itself.

Things you will need to consider in your purchase are:

- Extraction unit
- Grid/honeycomb bed
- Chiller unit (essential for glass tubes)
- Interface cables
- Software
- Delivery
- Installation and training
- Lifetime support and aftercare

TOP TIP!

When comparing costs, ensure the quotations you get are as clear as possible.

Look to get everything itemised, even if they are part of a package, and watch out for hidden costs.

Warranty and maintenance

What is covered, and how long for?

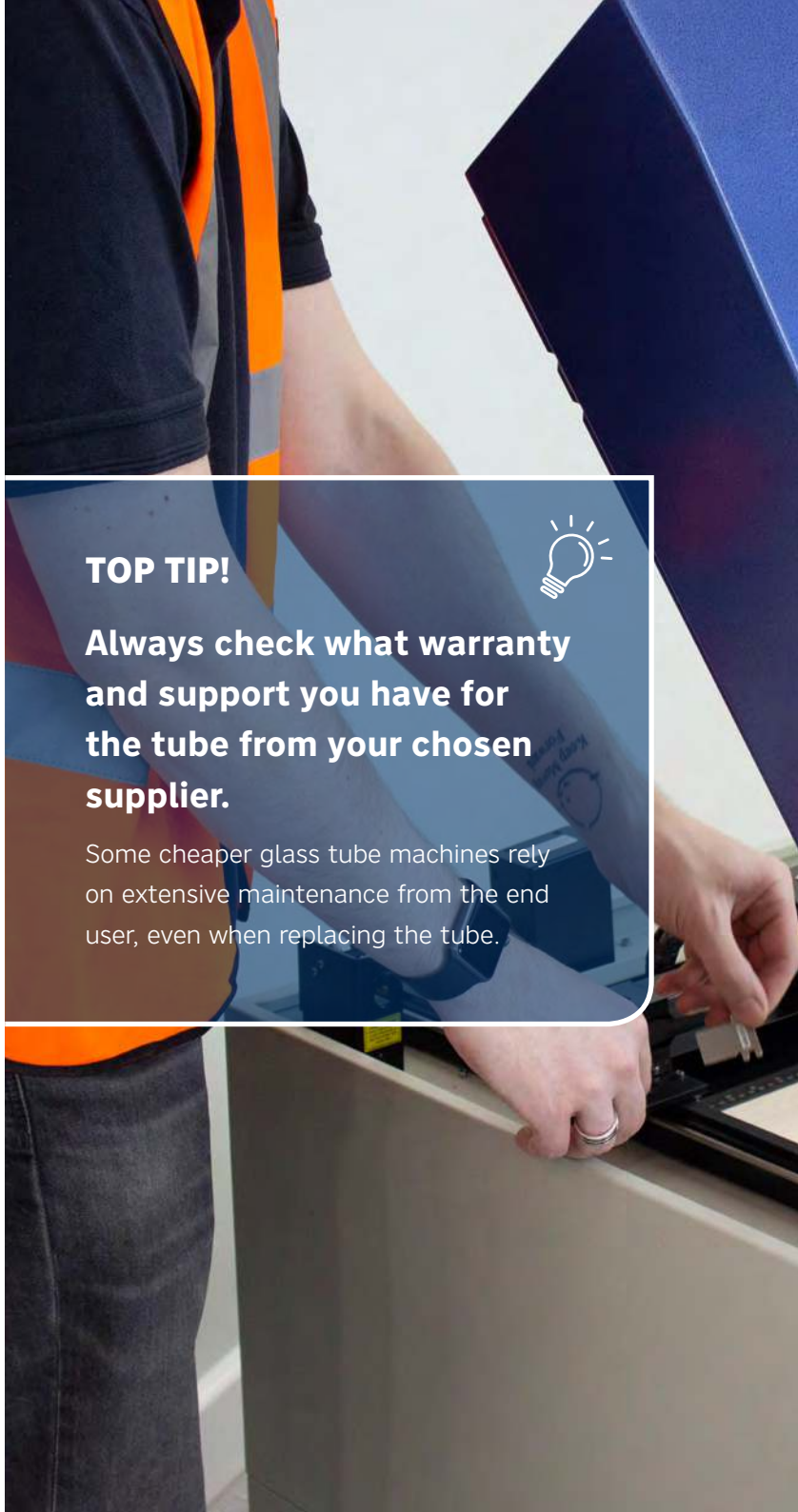
As with any large equipment purchase, warranties offer security throughout the life of your product, but remember that different suppliers and manufacturers will have different warranty structures.

Consider the following questions:

- What does the warranty cover? The machine and laser tube usually have separate warranties, where the tube warranty is shorter.
- How easy will it be for you to raise a warranty claim with your chosen supplier?
- Is a dedicated, UK-based support team available when you need them to be?
- Are parts available in the UK and are you expected to fit any of them yourself?
- Outside of the warranty, are there any additional call-out charges? Extra costs can quickly mount up.
- Is regular servicing available, and at what cost?
- Is any maintenance that is to be undertaken by you, the user, fully covered in any available training sessions?

Maintenance

Regular maintenance is also very important to ensuring your laser cutter runs at an optimal level for as long as possible. It's a good idea to have one person in your institution who is responsible for the maintenance of the laser cutter who will understand the optics and why it is important to keep it cleaned and maintained.



TOP TIP!

Always check what warranty and support you have for the tube from your chosen supplier.

Some cheaper glass tube machines rely on extensive maintenance from the end user, even when replacing the tube.

Funding

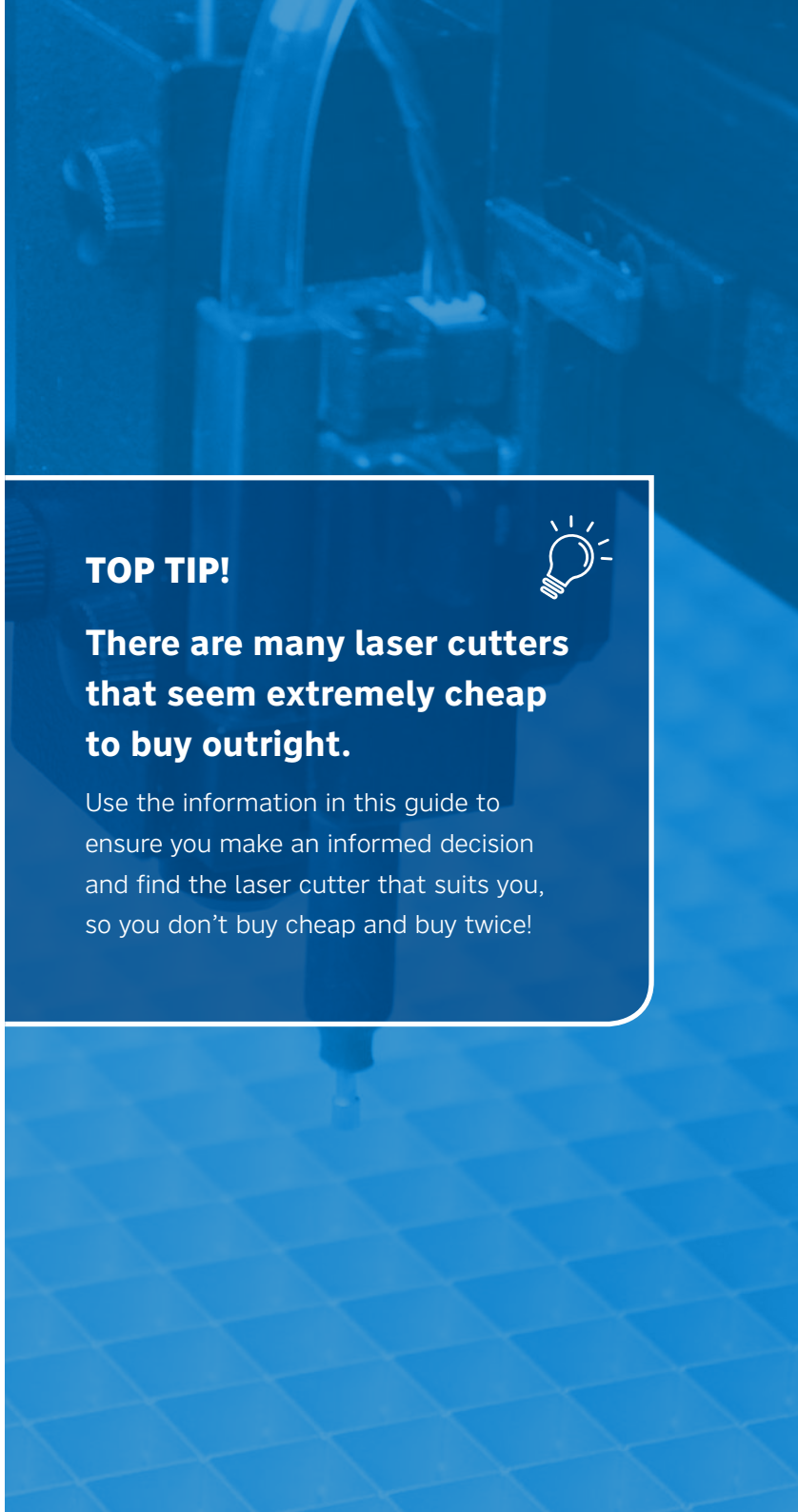
Can you afford it?
Keep an eye out for different payment options!

A laser cutter is probably more affordable than you think. There are now more models on the market as they are no longer used exclusively in industry, making them a realistic option for many schools. Even so, it is still a significant purchase and it's important to consider the information in this guide before buying a sub-standard machine that you will have to renew before long.

There are many ways to raise funds. For example, some schools have strong links with local businesses and apprenticeship programmes, which can lead to sponsorship of equipment.

As a laser cutter can be used across the school in many different departments, why not put budgets together and share the use of the laser cutter?

An alternative to purchasing outright is leasing, which means you can have a package tailored to your requirements with flexible payments and an upgrade path at the end. This enables you to renew the technology while keeping the costs down. Some suppliers who also offer rental options, which give you the flexibility of running a laser cutter in the short term at a minimal cost, which gives you the use of a machine and may, in turn, help you justify your bid to own one.



TOP TIP!

There are many laser cutters that seem extremely cheap to buy outright.

Use the information in this guide to ensure you make an informed decision and find the laser cutter that suits you, so you don't buy cheap and buy twice!

Other services

Design Consultancy & Installations

From all-encompassing 'Innovation Spaces' to Design & Technology and Library installations including FF&E; our projects team offer a comprehensive, bespoke service from design consultancy and planning through to installation and training covering refurbishments and new builds.

We have a team of experienced, in-house designers and education specialists offering a consultancy, design led solution that will equip your school with next generation, innovative learning environments for your students.

Servicing & Maintenance

We also offer comprehensive servicing and maintenance contracts carried out by our qualified engineers on all workshop equipment including laser cutters.

D&T Supplies

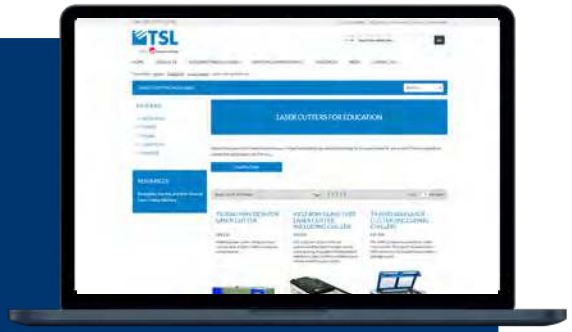
Every year in the UK, 3.5 million students are taught using consumables that have been soured from TSL. We have everything you need for Design & Technology with thousands of products across materials, engineering, electronics, graphics and more.

What to do next?

TSL has over 13 years' experience of supplying Laser Cutters and packages for educational use. We offer a comprehensive range of products, backed up with our in-house expert knowledge and technical support.

View all lasers online

Go online and filter our wide range of laser cutters based on your requirements. **View all laser cutters**



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