

Laser Systems for Education

Funding Your Laser, Benefiting Your School and Expanding Your STEM Curriculum.

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How a Laser can Benefit Your School

How a Laser can Benefit Your School

→ **STEM**

- Science, Technology, Engineering and Mathematics

→ **Art & Design**

- Aspiring artists can let their creativity flow and create impressive works of art using a Trotec Laser.

→ **Prototypes & Models**

- Give your students the ultimate tool to create prototypes quickly and easily. Engineering minds can put their ideas to life using a Trotec Laser system.

→ **Awards & Fundraising**

- A Trotec Laser can easily and quickly pay for itself, as well as fund additional programs. The opportunities are endless!
 - Awards
 - Cut letters, shapes, decals, etc., for school events
 - Promotional items
 - Personalized gifts and commemorative items such as holiday ornaments, picture frames, etc.



What is Crowdfunding?

What is Crowdfunding?

- Crowdfunding is the practice of funding a creative project or personal cause using an online platform to reach a large audience.
- Platforms such as Kickstarter, Indiegogo, or GoFundMe are full of financial backers who are responsible for the project coming to life.
 - Initially, funds are sourced through the support of the creator's friends and family. Before long, it evolves into a larger show of support and admiration from fans. Therefore increasing word-of-mouth advertisement for the project.



How to Start a Campaign for Your Laser

How to Start a Campaign for Your Laser

Which Crowdfunding Platform is Right for Your School?

	Kickstarter	IndieGoGo	GoFundMe
Description	<p>Global community built around artists, filmmakers, designers, developers and innovators which aims to bring creative projects to life</p> <p>The funding approach focuses on “All or Nothing” and the fees are reasonable</p>	<p>A global community set on creative projects, personal causes, and life-events</p> <p>The goal is to “empower everyone” with lower funding goals and reasonable fees</p>	<p>Platform designed to support personal causes and life-events, regardless if it is focused on a business or charity</p> <p>It is recognized more as donations than a community of backers</p>
Costs	<p>5% fee from funding total if campaign is successful</p> <p>3-5% processing fee from each pledge</p>	<p>5% overall platform fee</p> <p>3-5% for PayPal transactions</p> <p>3% for each credit card transaction</p>	<p>Free to create and share campaign</p> <p>5% fee from each donation</p> <p>3% processing fee for each donation</p>



How to Start a Campaign for Your Laser

How Does Crowdfunding Work?

1.	The creator should begin their Crowdfunding campaign with an introduction to the project detailing the potential for growth and revenue.
2.	They should include pictures and video of the product or service that they intend to have funded into reality.
3.	The creator should be very specific with the item they are campaigning (i.e., Trotec laser for cutting and engraving services.)
4.	The support they receive from the initial backers will be the starting phase of growing their market into an ideal niche.
5.	The backers rewards for example can consist of a copy of what is being produced or a unique experience to the project.
6.	Project creators keep 100% ownership of their work, and backers will not be charged toward a project unless it reaches its funding goal.

How to Start a Campaign for Your Laser

Alternative Finance vs. Traditional Finance

- Crowdfunding emerges from the concept of Alternative Finance.
 - Alternative Finance refers to generating capital for a project or cause outside of traditional financial institutions. Thereby eliminating the potential risk often associated with regulated banks.
 - Alternative Finance uses technology-enabled platforms in order to connect the fundraisers directly with the funders, in turn, it reduces transactional costs and increases market efficiency.



How to Start a Campaign for Your Laser

Disadvantages of Regulated Banks

1. Long list of prerequisites to be met in order to even qualify for a non-profit loan.
2. Lengthy application process where the outcome of the finances could take months or years depending on the credentials of the business.
3. Collateral Factor - If the business does not succeed in paying off the loan, the entrepreneur's house or property is at risk.
4. Banks do not guarantee the entire lump sum requested will be approved, therefore, alternative funding will still be present for all start-up costs.
5. Lastly, banks give preference to existing businesses that are already successful, thereby reducing the chance of a new company to be sanctioned and approved.



How to Start a Campaign for Your Laser

Do Your Market Research

- When you begin a campaign for a laser, it is beneficial to do your market research. Since the laser industry is in an incredible growth stage, it is highly recommended to visit the sites listed below to further your education and expand your resources.
- Book: The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses.

<u>Laser Manufacturers</u>	<u>Crowdfunding Platforms</u>	<u>New Business Resources</u>	<u>User Forums & Tutorials</u>	<u>Industry Websites</u>
www.troteclaser.com www.rayjetlaser.com www.epiloglaser.com www.ulsinc.com	www.kickstarter.com www.indiegogo.com www.gofundme.com www.crowdfunder.com	www.sba.gov/starting-business www.startupnation.com/ www.nfib.com/ www.score.org/startup	www.sawmillcreek.org www.instructables.com www.engraversregister.com www.troteclaserinc.blogspot.com	www.a-e-mag.com www.nbm.com www.signexpo.org www.sgja.org www.awardspersonalization.org www.engraversjournal.com www.sdgmag.com/ www.signstimes.com/ www.signshop.com/

Kickstarting Your Way to Success

Trotec Case Studies



Kickstarting Your Way to Success

Case Study - Artisan Dice

1,131 backers pledged \$91,542 to help bring this project to life

- Artisan Dice was created by Charlie Brumfield in 2012. The concept behind it stems from a lack of fudge dice on the East side of Dallas, Texas.
- The dice are marked with a Trotec Speedy 300 Flexx.
- Polyhedral sets are laser engraved using the same system.
- There are over 313 dice selections to choose from with almost 50 types of wood available as well as other specialty materials.
- Pricing ranges between \$20 - \$200 per set.



- **Funding Goal:** \$300
- **Funding Period:** Mar 8 2012 - Apr 7 2012
- **Trotec Solution:** Speedy 300 Flexx
- **Total dice made for backers was roughly 10,000.**

Kickstarting Your Way to Success

Case Study – Etchpop

519 backers pledged \$21,413 to help bring this project to life

- Chester Lindgrin and Marshall Tipton designed an online service where customers can purchase laser engraved woodblocks for creating custom prints.
- They use Shina Plywood, which is fine-grained plywood from Hokkaido, Japan.
- Etchpop's Kickstarter campaign was so successful that it enabled them to create a subsidiary company called MC Laser Lab for custom laser cutting and engraving.
- They have over 19 designer blocks available for purchase, as well as limitless potential for custom blocks.
- Prices range from \$50-\$250 with an additional \$40 for the starter kit.



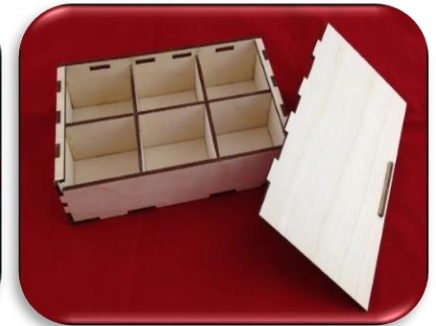
- **Funding Goal:** \$9,999
- **Funding Period:** Oct 27 2011 - Dec 1 2011
- **Trotec Solution:** Speedy 300 80W

Kickstarting Your Way to Success

Case Study – Go 7 Gaming

1,197 backers pledged \$79,929 to help bring this project to life

- Bobby Griggs set out to create a better storage solution for board game components.
- The storage bins and chests all consist quality HDF, Baltic Birch plywood and acrylic which is laser cut using a Trotec Speedy 400.
- All of the inserts and chest kits come pre-assembled or require construction with glue.
- He has produced over 40+ product designs for storage solutions, double-sided damage tokens and inserts for organization.
- Pricing ranges anywhere from \$7-\$50 per product.



- **Funding Goal:** \$5,000
- **Funding Period:** Nov 26 2013 - Jan 2 2014
- **Trotec Solution:** Speedy 400 80W

STEM Curriculum

Built Around Your Laser



STEM Curriculum: Built Around Your Laser

Curriculum Overview



→ This Trotec curriculum package is designed to help teach your students how to utilize laser engraving technology with safe operation and technological design through lesson plans that introduce set-up and support elements.

Primary Components of Each Project		
Information	Design	Materials
Terminology Safety Set-up	Elements Illustration Software	Woods Rubber Metal Plastics Acrylics



STEM Curriculum: Built Around Your Laser

Mode of Instruction



- This curriculum package is available for teachers who provide standards-based lessons in their middle and high school level classrooms and/or labs.
- Lessons can be taught in small groups, large groups or individual laser engraving stations.
- The length of the lessons will depend on your class length.
- Forty minute classes will take longer to complete the lessons than block scheduled classes.
- The lessons will vary in application description, therefore take the time in consideration when planning for subsequent years.



STEM Curriculum: Built Around Your Laser

STEM Standards



→ The lessons are considered standards-based as they are designed around four sets of national STEM standards.

1. Science
2. Technology
3. Engineering
4. Mathematics

Respected Organization Include

The Standards for Technological Literacy: Content for the Study of Technology, www.iteea.org/taa/pdfs/xstnd.pdf
International Technology and Engineering Educator Association (www.iteea.org)

Common Core State Standards for Mathematics www.corestandards.org/the-standards/mathematics, Common Core State Standards Initiative, National Council of Teachers of Mathematics (www.nctm.org)

National Science Education Standards www.nsta.org/publications/nse.aspx National Science Teachers Association (www.nsta.org)

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas
www.download.nap.edu/catalog Committee on Conceptual Framework for the New K-12 Science Education Standards;
National Research Council

STEM Curriculum: Built Around Your Laser

Educational Benefits for the Students

- Personal and Project Management
- Science and History
- Materials
- Supporting Tools
- Laser Operation
- Graphic Essentials
- Health and Safety

Project Ideas



Trophies and awards



Wood/metal combinations



Electronics engraving



Glass engravings

STEM Curriculum: Built Around Your Laser

Recommended Learning Resources

→ Personal and Project Management

- Rahulbotics Box Maker Program
 - <http://boxmaker.connectionlab.org/>
- Quoting a Job with a Laser
 - <http://sawmillcreek.org/showthread.php?179651-laser-cutting-quote>

→ Science and History

- Co2 Laser Works
 - <http://boxmaker.connectionlab.org/>
- Different Types of Lasers
 - https://en.wikipedia.org/wiki/List_of_laser_types
 -

→ Laser Operation:

- Trotec's Operation Guide
 - <http://www.troteclaser.com/en-US-US/Support/Pages/Manuals.aspx>
- Trotec's Job Control Software Guide
 - <http://www.troteclaser.com/en-US/Support/Documents/JobControl-Manual-EN.pdf>



STEM Curriculum: Built Around Your Laser

Recommended Learning Resources

→ Materials

- Acrylic Types
 - http://www.pmma.dk/acryl_stobt_kontra_ekstruderet.aspx?Lab=en-GB
- Lasing PVC
 - <http://www.bofa.co.uk/lasingPVC.asp>
- Engraving Materials
 - <http://www.troteclaser.com/en-US-US/Materials/Pages/Material-Overview.aspx>

→ Supporting Tools:

- Using Digital Calipers
 - http://tresnainstrument.com/how_to_use_digital_calipers.html

→ Graphic Essentials:

- Trotec's Rayjet Commander Software Guide
- Trotec's Rayjet User Guide



STEM Curriculum: Built Around Your Laser

Recommended Learning Resources



→ Health and Safety

- Laser Cutting PVC
 - <http://bclaserworks.com/pdf/lasercutpvc.pdf>
- How to Find MSDS Sheets
 - <http://www.ilpi.com/msds/>
- Trotec Laser Safety
 - <http://www.troteclaser.com/en-US-US/About-Trotec/News/Pages/2013-04-Laser-Safety.aspx>
- Trotec Exhaust
 - <http://www.troteclaser.com/en-US-US/Laser-Machines/Accessories/Exhaust-Systems/Pages/laser-exhaust-atmos.aspx>



STEM Curriculum: Built Around Your Laser

Material Selection

→ Materials Overview

With the machines from the Speedy flexx series you can process a wide range of materials. A selection:

	Material	CO ₂	Fiber
Non-metals	Wood	•	
	Glass	•	
	Paper	•	
	Textiles	•	
	Leather	•	
	Stone	•	
	Food	•	
	Ceramics		•
Plastics	ABS, PC, PA, PMMA, ...	•	•
	Rubber	•	•
	Engravable Plastics	•	•
	Foam	•	•
Metal	Aluminum		•
	Anodized aluminum	•	•
	Brass		•
	Carbide		•
	Chrome		•
	Copper		•
	Precious metals (gold, silver, platinum)		•
	High speed steel		•
	Stainless steel		•
	Titanium		•

→ Advantages of Laser Technology

Added Value through Personalization

Turn standard products into something unique. By adding logos, names, photo engravings, embellishments, texts, serial numbers and letterings to a variety of materials and objects, you can create custom products for your customers.

Broaden Product Range and Increase Sales

Harness the ability to offer new products and expand your range by offering your customers new product ideas. This means more profit for your business.

Incredible Design Opportunities

Virtually any design can be realized with the laser. This offers you full freedom when creating designs. Photos can also be quickly and easily implemented.

From Single Pieces to Series Production

The production of single pieces, as well as small or even large series, is cost-effective and economically feasible. The largest available range of products and the flexibility of our systems make it possible.

Non-Contact Material Processing

During processing such as mechanical engraving, materials must often be clamped in place or fixed with a vacuum. This is not necessary in laser processing, saving time and money.

A Universal Tool for All Materials

The laser beam is the universal tool for everything. Plastics, wood, glass, MDF, acrylic, textiles, cardboard, paper, foils, metals, and much more. Tool or grinding costs for milling cutters are eliminated.

→ Why Trotec?

Best Engraving Results at a Record Pace

Trotec laser systems can produce even the most complex graphics in optimum quality on your material, and at record speeds. Our machines are built to create precise and reliable engravings of your designs even at top speed and acceleration.

Simply Intuitive

Trotec lasers are as easy to use as a printer. Work in your usual graphics programs and send your layout to the laser, no matter whether from your PC or Mac. No specially trained operators are required.

Flexibility at All Levels

Developed by Trotec, flexx technology combines a CO₂ and a fiber laser source in a single device. Use it to process a variety of materials in a single pass, for which you would need two devices from other laser manufacturers. This saves time and money.

Full Control

The Job Time Calculator calculates engraving and cutting times before the job is started. This facilitates production and cost planning. The Trotec JobControl[®] software records your processed jobs, making post-processing calculation a breeze.

The Right Device for Every User

With the widest range of flatbed lasers, Trotec offers the right device for every kind of application. From beginners to professionals. Whether for a one-man business or large enterprises, Trotec has the right system for you.

Robust and Durable

Trotec laser systems have a robust design, providing many years of intensive use. There are no additional costs for maintenance and spare parts, equating to the lowest lifetime operating cost for laser systems.

Trotec Laser Overview

Trotec Laser Overview

trotec[®]
laser. marking cutting engraving

- Trotec lasers are the fastest and most productive systems on the market. The performance, productivity, quality and reliability of a Trotec adds up to a lower total cost of ownership which translates into increased value. The following slide will give a brief overview of the laser systems we carry: Rayjet, Speedy, and large format options.



- Rayjet lasers are user-friendly systems that provide an easy and efficient way to cut, mark and engrave a wide array of materials types, shapes and sizes with unlimited design freedom.



	Working Area (in.)	Laser Power	Laser Type	Software Included
Rayjet 50	18 x 12	12-50W	CO ₂	Rayjet Commander
Rayjet 300	29 x 17	60-80W	CO ₂	Rayjet Commander

Trotec Laser Overview

Speedy



- The Trotec Speedy 100 laser engraver offers a compact, entry-level solution carefully designed to meet the evolving laser cutting and engraving needs of growing businesses. It is scalable in terms of software, performance and laser power. It is available with CO2 or fiber laser or both.
- The Speedy 300, Speedy 360 and Speedy 400 laser systems offers the mid-size solution with ultimate speed, precisions and productivity. They are available with CO2 and fiber laser. They are equipped with a flexible table design and allows operators to access the work area and quickly and easily unload bulky and/or heavy jobs.

	Working Area (in.)	Laser Power	Laser Type	Software Included
Speedy 100	24 x 12	12-60W	CO ₂	JobControl®
Speedy 100 FL	24 x 12	10-30W	Fiber	JobControl®
Speedy 100 flexx	24 x 12	40-60W CO ₂ 10-30W fiber	CO ₂ & Fiber	JobControl®
Speedy 300	29 x 17	30-120W	CO ₂	JobControl®
Speedy 300 FL	29 x 17	10-50W	Fiber	JobControl®
Speedy 300 flexx	29 x 17	30-80W CO ₂ 10-50 W fiber	CO ₂ & Fiber	JobControl®
Speedy 400	39 x 24	40-120W	CO ₂	JobControl®
Speedy 400 FL	39 x 24	10-50W	Fiber	JobControl®
Speedy 400 flexx	39 x 24	40-120W CO ₂ 10-50 W fiber	CO ₂ & Fiber	JobControl®



Trotec Laser Overview

Large Format

- The SP500 is the ultimate laser cutting and engraving system for processing large format materials with speed and precision. High-quality, perfectly matched components make this laser cutter the most reliable partner. Low maintenance costs, perfect cuts and a thoughtful range of options support you in large format processing.
- The SP1500 stands for top quality with minimum maintenance. The individual components like motion system, optics, electronics, working head, and laser source feature the highest quality materials. Trotec's proven Inpack-Technology protects all valuable components from dust and gases ensuring long-term reliability and trouble-free operation.

	Working Area (in.)	Laser Power	Laser Type	Software Included
SP500	49 x 28	60-200W	CO ₂	JobControl [®]
SP1500	59 x 49	60-400W	CO ₂	JobControl [®]



Trotec Laser Overview

Additional Options

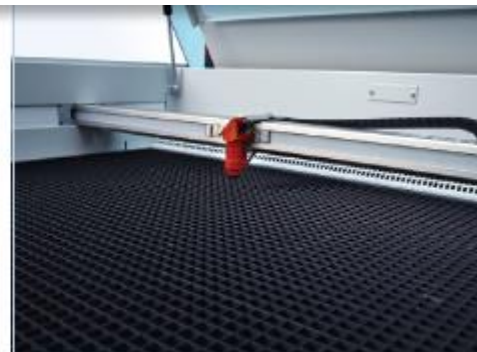
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Vacuum table for thin and light materials



Cutting table with aluminium lamellas for reflection-free cutting



Black aluminium grid for cutting of small pieces



Rotary Attachment

The rotary attachment makes easy work of engraving cylindrical, conical, or spherical objects such as bottles, glasses, balls, or mugs. For maximum flexibility, the rotary device is available with cones, rollers, or both cones and rollers in one device.

Working Tables

Choose from various working tables depending on your application: magnetic engraving table, vacuum table, cutting table (lamellas), black aluminium grid-table, honeycomb table for vacuum table or white plastic cutting grid. Materials of up to 12" in height can be processed.

Additional Lenses

Trotec offers 1.5", 2", 2.5", and 4" CO₂ lenses, 3.2" and 5" fiber lenses, as well as a 2.85" flexx lens for the Speedy 300. Using a lens with a proper focal length guarantees perfect engraving, cutting, and marking results every time.

Air Assist

Air assist protects the optics and improves cutting results. Utilizing air assist also prevents combustion of flammable materials and helps direct debris and fumes toward the exhaust and vents. The operator has control of activating, deactivating, or programming the air assist to activate automatically via JobControl[®].

Trotec Laser Overview

Additional Options

trotec[®]
laser. marking cutting engraving



Rotary attachment for bottles or glasses



JobControl[®] Vision system



Pass-through for bulky materials

→ JobControl[®] Vision

Printed signs, displays, and POS materials can be cut to exact specifications using laser technology and JobControl[®] Vision. With other methods, slight distortions of the print create unsatisfactory results. However, JobControl[®] Vision recognizes any distortions in the printed design. Whether it's linear, non-linear distortion, or a rotation, the cutting path is adjusted automatically and dynamically. The cutting lines always perfectly match the printed design.

Pass-through

The Pass-through option facilitates processing of very long and bulky parts. This feature makes the Speedy 400 a laser safety class 4 device.

Postscript Converter

The unique PostScript converter converts EPS and PS Postscript files, PDF, BMP, JPEG, and TIFF files into a "Trotec spool file" format.

Exhaust Systems

Trotec offers a variety of exhaust systems. All of our exhausts are designed to fit your application needs and are built for optimal operation for your laser system. Special integrated electronics allow you to control your Trotec exhaust system remotely via your JobControl[®] software.

Trotec STEM Curriculum

Program Details

- The Trotec STEM Curriculum was available starting July 6, 2015.
- The Curriculum is available for customers on DVD.
 - Each customer will receive a personalized curriculum presentation with an assigned license key.
 - License keys are good for two years and will require sign-off on a "Terms of Agreement" form which will be kept at TLI.



STEM

- The value of the curriculum is \$875
- It can be offered to customers at no charge.
- The TLI Marketing Team sends out two Education email campaigns per quarter to all territories.
- The following marketing support materials are available:
 - Trotec educational STEM bi-fold brochure
 - Expanding Minds sample & electronic file
 - EDU Curriculum Guide

The use of laser technology in the classroom setting offers unmatched potential for learning and business opportunities:

Thank You

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Contact us for a demo, free samples, or to discover which Trotec laser system is right for your budget and application.

Application examples CO₂ laser



Application examples flexx



Application examples fiber laser



Trotec Laser, Inc.
7610 Market Drive
Canton, MI 48187

Tel: 866-226-8505

Fax: 734-927-6323

sales@troteclaser.com

 www.facebook.com/TrotecLaserInc

 twitter.com/TrotecUSA

www.troteclaser.com

