

FTC Useful Tools and Resources

Team 13380 Quantum Stingers



Intro

- Aside from vendor-sold parts, your team may find **custom(ized) made parts** handy
 - Custom parts allow for more versatile building, as well as options for robot personality
 - Can be obtained through **3D printing** or **cutting/carving** (laser cutters, CNC machines, vinyl cutters, power drills, saws, etc.)
- In addition, to **assist** and boost **ease of building**, there are many tools like a **vice** or a **workbench**
- To assist with the design process, **CAD/CAM softwares** can also be used (Fusion 360, Inventor, Solidworks, etc.)
 - Can be used to help **assemble digital** and **computerized models** of your robot/parts of it
 - Can be used to **sketch/model** certain **custom parts** to print, cut, or carve

Hardware

- **Production** tools that you may need:
 - 3D Printer
 - CNC Machine
 - Vinyl Cutter
 - Laser cutter
 - Power Drill
 - Circular Saw
 - Hex Key
 - Torque Wrenches
 - Screwdriver Kits
- **Assistance** tools that you may need:
 - Vise
 - Workbench

3D printer

- **Why might it be useful**

- **Flexibility**

- As briefly mentioned before, there is a high probability that you won't be able to find every single part that you are looking for, and you may want to **innovate a part that requires a special component** which many of the places you are going to buy parts from don't have

- **Ease in Integration**

- By using a 3D printer, you can innovate these parts with whatever constraints you would like them to have, and you can easily check your robot, to see how you can integrate the parts so that they work properly

- **Customization**

- It is always good to not only add various aspects of the tech challenge into your robot but your team personality as well, with the 3D printed parts, you can customize color schemes and other parts of your robot to make your robot represent

- Con: They do take a **while to actually be made** and **can break** if the robot or part is not regulated properly. They are also quite expensive and can take up a lot of space

- Where can you buy this?

- <https://tinyurl.com/v96gt9q>

- Here is one link, but there are still other options out there which is up to your team based on your team budget

CNC Machine

- What are CNC Machines?
 - CNC Machines, otherwise known as computer numerically controlled machines, are electro-mechanical devices which you can use to manipulate tools/parts around varying parameters. They can cut metal, acrylic, plastic and wood
- What are some uses?
- **Adaptability**
 - Some parts that you buy down the line fit the purposes you require but not the parameters in order to integrate them into your robot, with a CNC machine, you can utilize CAM models in order to input to the machine what you want to cut off of the part through g-code
- **Speed**
 - This is a subtractive process meaning that you take a part and cut it down whereas 3-D printing is an additive process where you start from scratch and use material, however, if there is a part similar to what you want, but maybe a bit too large or there are some parts of it you don't need, this is faster than 3-D printing the whole part from scratch
- Con: It is considerably louder than that of a 3-D printer, however, if you have a garage allocated for your team, it shouldn't pose a big problem, it is also very very expensive ranging from \$1,500 - \$20,000, so they may not be accessible to everyone
- Where can I buy it?
 - <https://tinyurl.com/tefywx3>

Vinyl/Laser Cutter

- Vinyl cutters: A computer-controlled machine that controls a sharp blade like a printer does a nozzle, and cuts over sheets of plastic
 - Can be used to make custom stickers, which help w robot personality
 - Pricing: Around a few hundred dollars
- Laser cutters: similar to a CNC machine, however, it uses a laser instead of a blade
 - Often used to cut wood or plexiglass, which can be used for walls/side mounting on your robot, or additional supports/parts
 - Pricing: considerably costlier, with high-end high-quality ones up to a few thousand dollars
- Where can I buy this?
 - Vinyl Cutter
 - <https://tinyurl.com/wqcjjwz>
 - Laser Cutter
 - <https://tinyurl.com/sb9ded6>

Circular Saw

- What is a circular saw?
 - A circular saw is a power-saw using a spinning/rotating toothed or abrasive disc or blade to cut different materials
 - May be useful to cut pieces shorter, such as to shorten a channel, or slide, etc.
 - It's a power tool, so make sure have adult supervisor nearby
- It is also one of the best/most effective tools to cut parts of parts metal parts manually (vs automated via CNC)
- Pricing:
 - Usually cost under \$100
- Where can I buy it?
 - <https://tinyurl.com/sq7b8rj>

Power Drill

- Power Drills are an essential part in your journey to building your robot, and they have many different uses such as:
- **Drill Holes**
 - It is important that you are drilling holes in order to make space for screws
- **Screw things in**
 - Using power drills to screw things in is a much faster alternative than that of a screwdriver, and are a lot stronger as well, so you may be able to screw things in tighter'
- A couple of cons of power drills include:
- These power drills are **fairly big and bulky** so it might hard to reach into your robot when you have screws you need to tighten in places that are hard to reach, you will also have to be waiting on power after the drill runs out of charge, in which case a screwdriver is more reliable
- Where can you buy it?
 - <https://tinyurl.com/tzy38el>

Vise/Workbench

- A vise is a helpful resource which helps keep a part that you are working on stable and in place
- A workbench is a helpful resource which you can use to work on different parts of your robot
- Pros: Both a vise and workbench are reliable and very helpful resources because they allow for further stability and control over what you are working on
- There really are no disadvantages of having a vise or a workbench, they are affordable, and are good to utilize while you are working
- Where can I buy a vise?
 - <https://tinyurl.com/tg8h6lt>
- Where can I buy a workbench?
 - <https://tinyurl.com/ub9czrj>

Hex Key

- A Hex Key, also known as allen key, is essentially a tool which is used to drive in bolts and screws
- A couple of benefits include:
- The Hex Key is fairly small and easy to transport, so it is better than a power drill in terms of transportation
 - Because of its size, it also allows places which are too small to be accessed by a screwdriver or power drill to be screwed in tightly
- Hex keys are very simple to use as opposed to having to screw in drill bits to a power drill and have adult supervision
- Cons: Because of its size, it may be hard to keep a grip on if you are using the smaller side adjacent to the longer side
- Where can I buy it?
 - <https://tinyurl.com/rp27cun>

Torque Wrench

- Torque wrenches are one of the most useful and important tools for FIRST teams
 - Torque wrench kits allow teams to fasten bolts of many different sizes
 - Torque wrenches fasten bolts much more tightly than if just a screwdriver was used



Here is a link to a useful kit of torque wrenches:

https://www.amazon.com/Husky-H4PCSTS-Stubby-Handled-Combination-Adjustable/dp/B01N91QKFZ/ref=sr_1_1?dchid=1&keywords=husky+tools&qid=1586552469&sr=8-1

Screw Driver Kits

- Screw driver kits are kits with multiple interchangeable screw driver heads
- These are especially useful when using screws from multiple vendors, which often come in different sizes and shapes
- These screw kits can replace the hoard of screws that many teams may have at home with one compact, useful kit
- This greatly decreases clutter and the frantic search for the correct screwdriver or hex key
- You can buy a screwdriver kit here
 - https://www.amazon.com/Precision-Screwdriver-Magnetic-Computer-Electronics/dp/B07TNS3D4X/ref=sr_1_1?dchild=1&keywords=royace+screwdriver+kit&qid=1586552742&sr=8-1

Credits

- This lesson was written by Sashv Dave for FTCTutorials.com
- You can contact the author davesashv@gmail.com



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