How to Buy a Plasma Table

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Congratulations on considering the purchase of a Plasma table. It's an amazing piece of machinery, and can truly unleash your creative potential. There's a lot of plasma table manufacturers to choose from, and a lot of advertising aimed at trying to convince you why their table is ‘best’ and how easy their software is to use. As a consumer, it's important to separate the truth from the marketing hype, and this article is aimed at doing exactly that.

Table Construction
Plasma tables need to be rigid in order to get the best cut, especially during rapid moves. Cheaper tables use bolt together aluminum frames and legs to reduce cost, but none of these can match the rigidity and precision of a welded steel frame. A properly designed welded steel frame won't warp under high heat or flex during use, ensuring a high quality cut is maintained for the lifetime of the table.

Gantry Movement
The gantry is what holds and moves the cutting torch on a plasma table. It moves the torch left to right, and front to back. The gantry can be guided by several different methods. As expected, precise movement is essential to obtaining a quality cut. The cheapest plasma tables use bearings which ride directly against the frame of the table. Some manufacturers install metal plates along the frame, which is slightly better, but still not much of an improvement. Neither method is a professional solution. Because linear guide rail offers the highest quality alignment, all professional quality tables use them for precise gantry movement.

Slats
Slats support the material as it lays on top of the plasma table. The slat support system needs to be rigid, in order to hold the material in place while it’s cut. Further, the slats should be closely spaced so as to hold or ‘bridge’ smaller pieces. Lesser quality tables utilize straight sided slats that are bent into an arc or wave shape to fit the table. Although less expensive to manufacture, straight sided slats can adversely interfere with arc voltage height control as they can be mistaken for thicker metal by the height control. The best slat support systems use heavy gauge steel 'shark tooth' style pointed slats, that hold the material firmly in place. This provides maximum support with minimal impact on THC.

Collection Trays
No matter how closely spaced the slats may be, it's guaranteed that some smaller parts will eventually fall down between the slats and end up in the bottom of the table. Properly designed collection trays make the process of small part retrieval much easier. Owners with tables built without collection trays will need to first pull the slats out, and then reach down into the table to retrieve the parts. Besides being irritating, this is no easy task with heavy plate steel loaded on top of the table.

Wheels

As discussed before, the best quality plasma tables have welded steel frames, and are therefore quite heavy. Roll-a-way wheels allow one person to easily move the table. Further, the best quality wheels also have jack pads built into the caster mechanism, which allows the table to be leveled after being moved into position. Having these built into the table can be a great space and time saver. Whether for clean up or at the end of the day, the table can be rolled into the corner, out of the way.

Ball Rollers
Ball rollers are used for loading material onto the table. They're attached along the top of the frame, and allow the user to easily load and position material into the exact spot necessary for cutting.

Protective Limit Switches
Limit switches prevent the torch and gantry from crashing due to accidental over-travel, and thereby becoming damaged. If a part design is too big or the table isn’t indexed properly, limit switches can save the day.

Homing Switches
Homing switches allow the user to index, or reset the table to a known 'zero point' at the beginning of the day. This enables the user to utilize work offsets, which allows the operator to reposition or index the torch to the exact same location time after time. This feature is essential when 'paneling', or cutting oversize parts which are longer than the table itself.

Cable Control
Proper wiring is a necessary part of any quality plasma table. Ensuring adequate cable protection is the mark of a quality table. Lower quality tables often don’t route or protect the cables properly. Professional tables will include a protective 'e-track', or carrier, to protect the wiring from snags and damage.

Controller
The controller refers to the electronics that control the movement of the table. Surprisingly, some tables offer nothing at all. Many use a windows based computer program. The disadvantage is that solution requires learning yet another software program. Professional tables use dedicated, stand alone 'smart' control panels to run the table. Dedicated smart controllers cannot get viruses, and do not suffer the lag or complexity of a windows based system. Advanced controllers feature an integrated library of shapes which include a huge variety of pre-designed shapes and parts. Most all of these parts can be further manipulated in size, number of holes, radius etc. With a dedicated parts library, it’s not absolutely necessary to learn a CAD or CAM software program, as many shapes are already prebuilt into the controller. Custom designed or frequently needed parts can be added or saved to the library, making it even more convenient.

Software
Software is probably by far the most complicated process of owning a plasma table (and because there's so much to consider, in the ArcStar library, we have a separate document titled 'Choosing the Best Plasma Software', which has a much more detailed look at what to look for when choosing a software package).

Very quickly you'll hear terms like CAD and CAM. CAD stands for Computer Aided Design, and is basically any software program that allows you to design parts. CAM stands for

Computer Aided Manufacture, and is a software program that tells your plasma table how to cut the parts you designed in the CAD program. In summary, CAD designs and CAM cuts.

Naturally, nearly everyone claims that their software is the 'easiest to use' and takes 'just minutes to learn'. The fact of the matter, is that most CAD/CAM programs are complicated, and there's a rather large learning curve that you must master well before you can start cutting parts. Additionally, CAD/CAM programs differ greatly in price – some are free, while others can cost several thousands of dollars ***every year*** in subscription fees. A very popular plasma table company doesn't reveal too much on their website, and only after the sale does the consumer realize that each 'advanced' feature of the software (there's six in total) requires an unlock code - at $1,000 per code!

Finally is the issue of tech support. Support plans vary enormously. Some companies offer literally no phone support at all, while others offer lifetime tech support at no additional cost.

The best advice we can offer is to be ***very*** careful when it comes to software. In our opinion, software is the most important part of owning a table - it's truly the make it or break it part of the equation. ***You cannot run the table without the software.*** Do not believe any of the hype or slick advertising until you try it yourself and completely understand exactly what the software will or will not do. Make sure to understand if you're getting the upgraded, top level software, and if not, ***what are the exact costs of upgrading.*** It's extremely important to ask these questions first, before it's too late.

Torch Height Control (THC)

In order to get the best cut quality possible, it's important to maintain the correct height between the torch and the material at all times. This is referred to as Torch Height Control or THC for short. In general, there are two distinct times that THC is important - first, when the torch initially touches the material, and second, while the torch is moving, or cutting. If the correct height is not maintained, it causes the consumables (the term given to the user replaceable parts of the torch) to become damaged, or consumed, very quickly.

Cheaply built plasma tables may have no form of THC. Customers who buy these tables without realizing the importance of THC soon find that their cut quality is terrible, and must constantly replace their consumables, which can quickly become quite expensive (much like the consumable in printers - ink - can become quite expensive). Some manufacturers sell their tables with the THC feature intentionally locked out. Later, only after the customer realizes the importance of THC, the customer is given the option to unlock the THC function only after they've paid several thousands of dollars in 'upgrade' fees. In the end, this sort of predatory practice forces the customer to pay for something that should already have been included to begin with.

The first form of height control is known as 'pierce height'. This is the distance at which the torch first pierces, or cuts into, the material. The worst method is where the customer must manually position the torch. Not only is this method very imprecise, it's also very time consuming.

The 'floating head' method is a second best way to set torch height. This is where the torch is mounted on a vertical slide. When the torch is driven downwards, a limit switch senses when the tip of the torch pushes down against the material, and sends a signal to stop the motor from driving the torch down further. The downside of this method is that the torch must physically push against the material in order to 'trigger' the switch. On thin material, this

method is not very accurate, as the weight of the torch typically deflects the material before the switch is activated. This leads to an improper height signal, which as discussed earlier, reduces the life span of consumables, and degrades the quality of the cut. The benefit of using a floating head system is that it does not rely on the material being conductive, and therefore works very well on rusted, or painted materials.

A better way to set pierce height is referred to as 'ohmic sensing'. This method very precisely measures the resistance between the tip of the torch and the material. To begin, the motor drives the torch downwards towards the workpiece. The instant the tip of the torch touches the material, the torch immediately stops moving downward. Ohmic sensing is by far the most accurate method of determining pierce height. This is especially true when cutting thin material, as the 'floating head' method must first push against the material, which will deflect and bend thinner metals, leading to inaccurate pierce heights. One consideration of using ohmic sensing is that water (even a single droplet) can cause the sensor to fail. This is yet another reason why a plasma table with a water table is not the best solution.

The best way to determine initial pierce height is to use a combination of ohmic sensing and floating head. Ohmic sensing serves as the primary detection method, with floating head as a backup if the material is rusted or painted.

The second form of height control is known as ‘cut height’. Cut height refers to the distance between the torch and the material as the torch cuts and moves across the material. In general, there are three methods to set cut height. The first is to set it manually. Once again, this is not a precise method, and once set, the height does not change unless the operator manually changes it, even if the material is warped and uneven.

The second method is to use AVC, or Arc Voltage Control. This method precisely measures the voltage between the electrode and the material being cut. It then compares the measured voltage to a preset value programmed previously by the operator, and adjusts the torch height accordingly. While the torch is cutting, if the torch moves away from the material, the voltage will increase, and subsequently AVC will drive the torch down. If the torch becomes too close to the material, the voltage will decrease, which will cause the AVC to lift the torch up, away from the material.

The third method of height control is voltage sampling. In this method, the operator programs a specific cut height. As the torch first begins to cut, the voltage is sampled, and the voltage value is then captured. Just like AVC, the torch height is then precisely adjusted to maintain the captured voltage. Consider this to be a more refined method of AVC.

The bottom line is that height control is a required component to make quality cuts. Make sure that this feature is included, and not another expensive upgrade that you’ll end up paying for later!

Breakaway Torch Mount

Everyone who cuts parts on a plasma table encounters 'tip-ups'. Tip-ups occur when a part is cut from a sheet, but does not remain perfectly flat, or fall completely through the slats, hence the designation 'tip-up'. The problem is, what happens when your torch runs into a tip-up? A breakaway torch mount does two things when your torch runs into a tip-up - first, it sends a signal to immediately stop the table from moving, and second, the plate holding the torch 'breaks away', thereby protecting the torch from damage. The best systems use two adjoining plates held tightly together by strong, rare earth magnets. Embedded steel balls ensure precise

plate alignment, both during normal operations, and after a breakaway is experienced. Inside, a contact switch provides the shutdown signal the instant a tip-up is encountered. As expected, cheap plasma tables often have no form of protection.

Plasma Cutter
Central to the performance and reliability of plasma tables is the plasma cutter itself. How thick a piece of metal you can cut relies almost entirely on which model of plasma cutter you choose to buy. Remember, the plasma table only needs to guide the torch, it doesn't cut the metal. While there are many different plasma cutters manufacturers available, most would agree that none can match the quality, performance, and reliability of Hypertherm. Another consideration is to choose a model which has a built in machine interface. Hypertherm refers to this as a 'CPC port'. Regardless of the terminology, a machine interface provides a convenient method to connect the plasma cutter directly to a plasma controller. Keep in mind that installing your own machine interface will likely void the warranty, so it's best to make sure and purchase a plasma cutter which already has this option installed. Finally, most plasma cutters offer two styles of torch - a curved, hand held type, and a straight 'machine torch'. Most professional plasma tables all require the 'straight' machine torch design.

Voltage Divider
In order to automatically control torch height, the plasma controller must get feedback from the plasma cutter. In order to do this safely, a voltage divider must be utilized. Fortunately, Hypertherm offers these as a convenient option in their plasma cutters. The internal switches are user selectable, and must be set to 50:1 (the default setting) in order to be compatible with the ArcStar controller.

Air Source
All plasma cutters require a source of clean, dry air. This can come from bottled air, or an air compressor. If using an air compressor, it may be necessary to route the air through an 'air dryer' before it gets to your plasma table. Hypertherm recommends a minimum of 6.7 cfm @ 85 psi for their Powermax45XP.

Electrical
Don't overlook the importance of properly planning for the electrical connections. Most plasma machines only need 110VAC, but the plasma cutter and air compressor will most likely need 220VAC. Same if you have a fume extractor - most will need 220VAC. Proper grounding is also important. Best results are obtained from a dedicated grounding rod installed right next to the table. Naturally, there are many opinions on the "correct" way to do this. As always, the internet is a vast oasis of how to correctly install and measure a proper grounding rod.

Smoke Elimination
A plasma table cuts metal by literally melting and blowing it away. If not dealt with properly, plasma cutting can leave a gritty, smoky mess. Many table manufacturers shy away from this topic, and only show pictures of factory clean, freshly painted tables. Buying a table without considering how to eliminate the smoke and dust can be a costly mistake. Generally, there are roughly four methods manufacturers use to mitigate the fumes and smoke created during the plasma cutting process.

The least expensive (and worst) method is to try and ignore the matter entirely. This method is obviously not recommended, as your shop (and lungs) will suffer the consequences.

Using water to capture the smoke is a better method, but also has some serious drawbacks. A tray of water, is built underneath the slats of the table. It's designed to catch the excess smoke and particles as the plasma arc cuts the material. The advantage of this method is that it's a relatively cheap solution and requires no electricity. Overall, it's fairly effective at eliminating the smoke. But it also has several drawbacks. First, because of the metal particles created during the cutting process, the water is conductive, and can interfere with ohmic sensing for touch off (more on this later). Second, the splashback from the water underneath the metal can negatively affect the quality of the cut. Third, the water will quickly become contaminated, and the issue of properly disposing the resultant mess can be a difficult, time consuming, and potentially expensive process.

The third method is known as an open extraction system. An enclosure is built surrounding the sides and the underside of the plasma table. A high performance extraction fan is installed on one end of the table. Finally, a duct is attached to the extraction fan leading to outside the building. While the plasma's cutting, the extraction fan creates a vacuum to draw the smoke and particulates away from the table, then vents them outside.

The fourth, and best solution is to use a purpose-built, closed loop extraction system. It's essentially the same as the open loop extraction system above, except that the duct is routed to a purpose built, portable filtration system rather than venting to the outside air. So just like the previous example, the smoke and fumes are drawn downward through the table and away from the operator, but instead of being vented outside, the vent is attached to a smoke extractor filter, also known as a 'smoke eater'. This standalone device filters the air through a 3-stage filter. Of all the solutions, this is by far the best for your health and the environment. Additionally, there's the added benefit of not exhausting all your heated shop air outside.

Summary

Many plasma tables are marketed at a reduced price, in order to attract customers and 'get the sale'. Many of these tables end up being less robust, and less precise, but ironically they end up being more expensive, as the unwary customer is forced to buy 'optional', but expensive upgrades in an effort to improve cut quality.

Our best advice is this - don't assume anything. If a model doesn't clearly state that it has Arc Voltage Control for THC, then it probably does not. If it did, it would be clearly be presented as such. Stating generic terms like 'Advanced Height Control' is nearly meaningless. Second, beware merchants that don't clearly advertise their prices. You can bet they're hiding something. Third, watch out for expensive 'optional upgrades'. Some manufacturers sell cheap tables to get you 'hooked'. Only after you've paid for the table and get it home do you discover it really doesn't work as advertised. This is especially true for software packages. Many a consumer has been duped into buying a low cost table bundled with an empty software package only to discover too late that you need to spend thousands more on 'optional' software upgrades. ***Remember this - you cannot run the table without the software.***

ArcStar