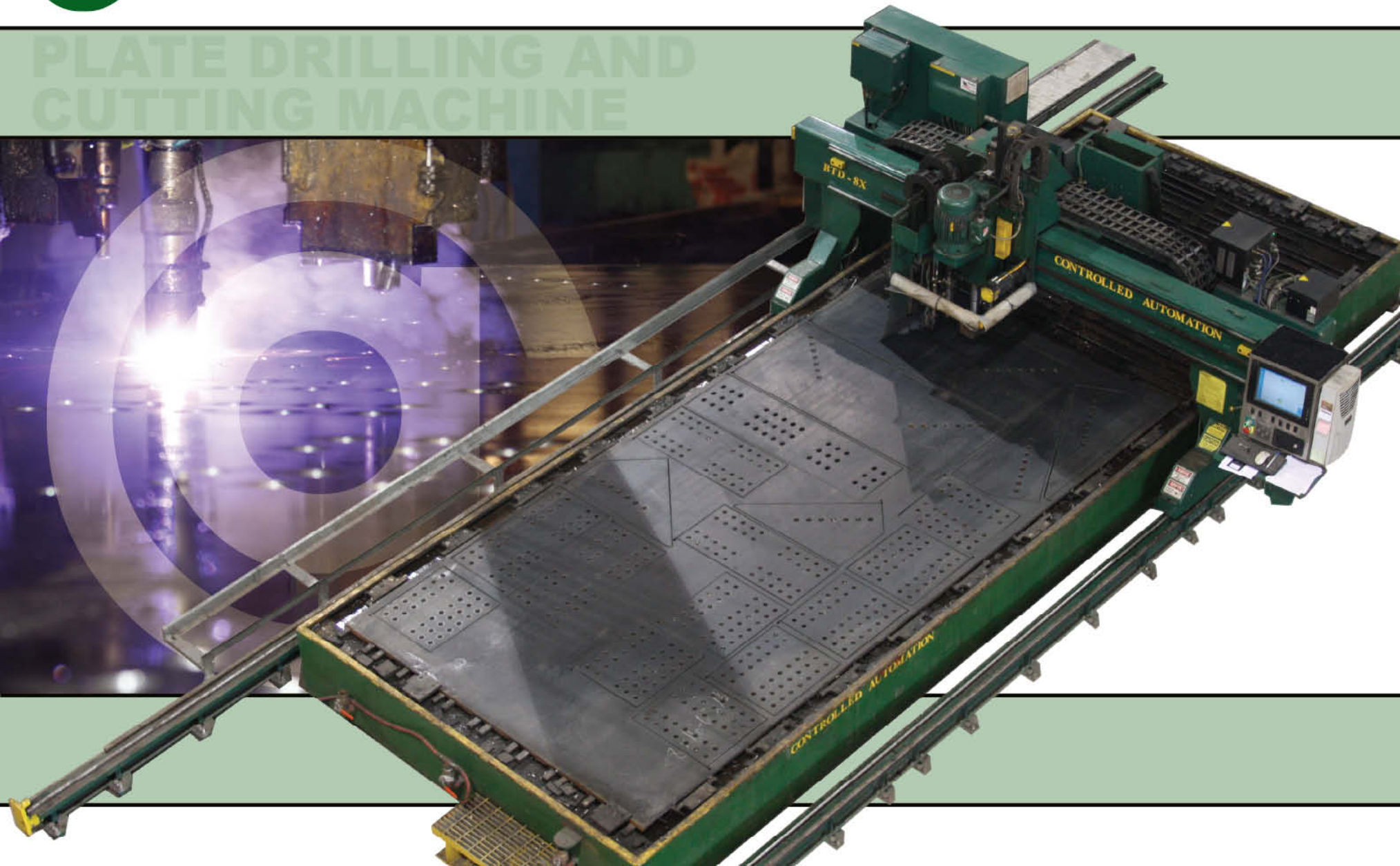
Controlled Automation BTD-8X

PLATE DRILLING AND CUTTING MACHINE



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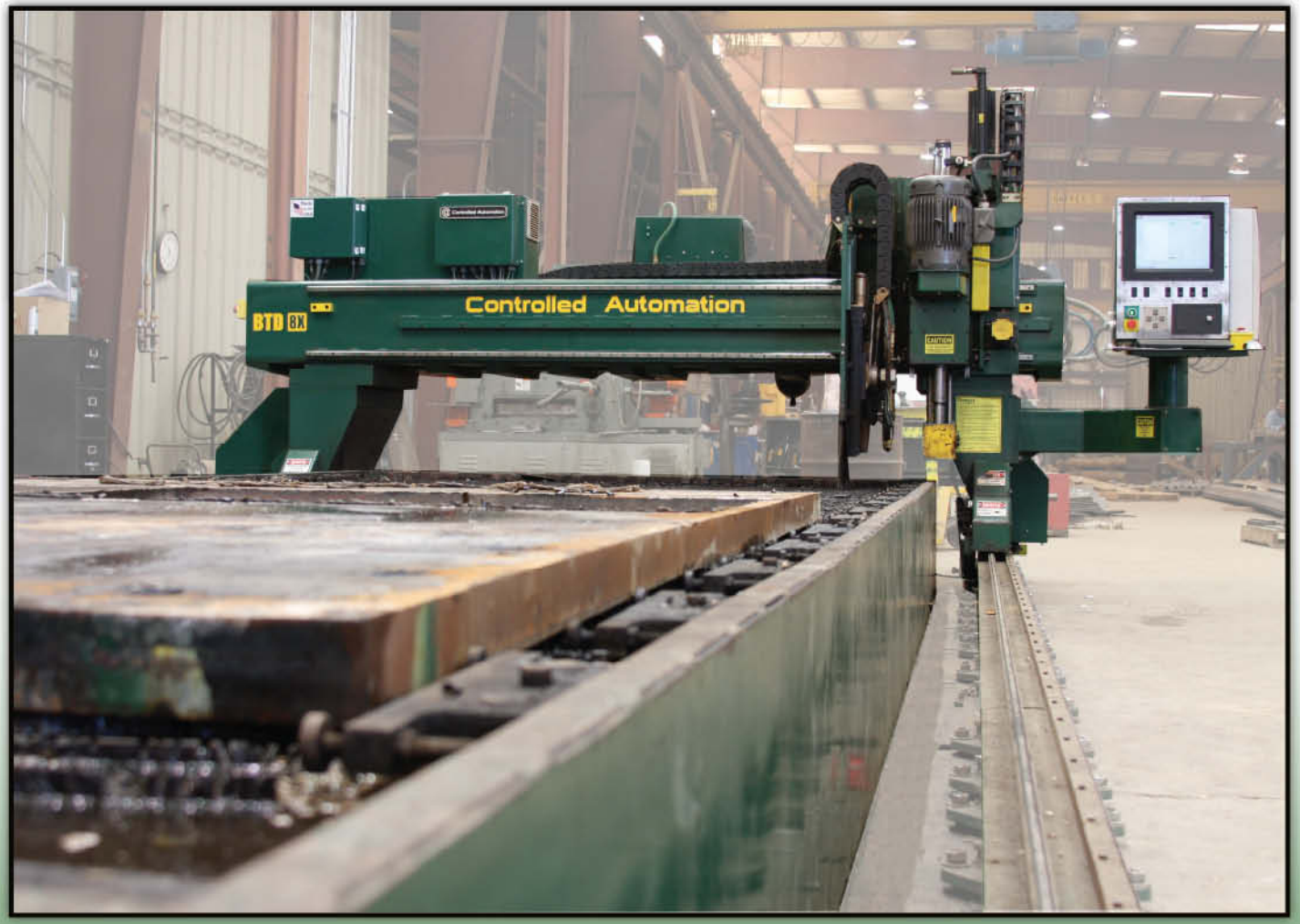


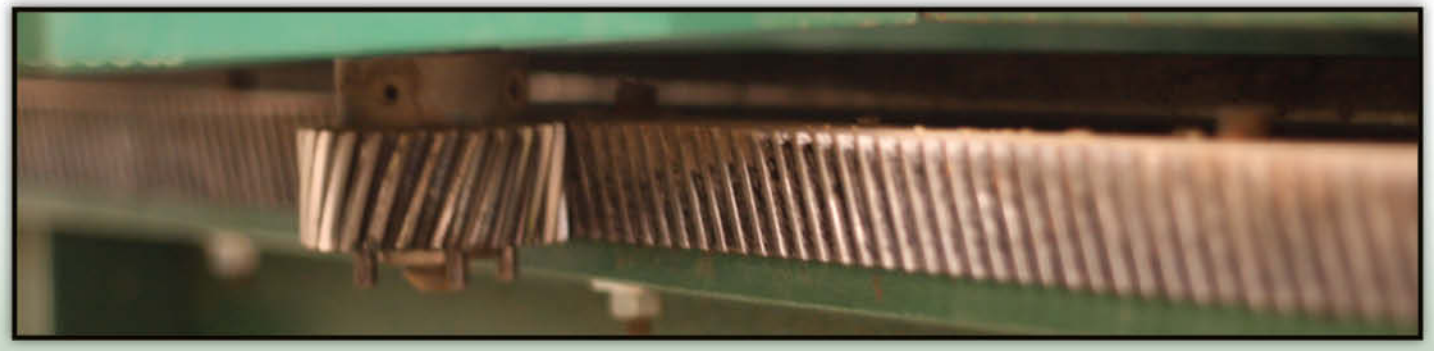
BTD-8X

The BTD-8X combines Controlled Automation's shape cutting and high speed drilling technologies to produce top quality thermally cut contoured parts with drilled and/or thermally cut holes.

With a core machine design of strength and stability, fast and responsive controls, and the advantages of high definition plasma and high speed carbide drilling, accurate, high quality parts are created quickly and easily with the BTD-8X.

Bridge Design

The machine bridge is a tubular steel section that has been stress relieved after welding, then machined down its length to provide a flat, straight seat for the guide rails. This provides superior accuracy for all tools. The tubular steel section is filled with a material designed to lower its resonant frequency which reduces vibration while high speed carbide drilling.



Guide Rails and Wheels

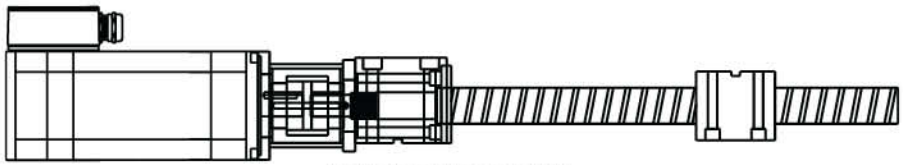
The bridge is supported by four pivoting wheel assemblies. Each pivoting wheel assembly houses two hardened support wheels for a total of eight wheel supports. By supporting the gantry with eight wheels in contact with the rail rolling surface instead of four, the lives of the wheels, the support rail, and the wheel bearings are doubled. The wheel assemblies on the guide side are "V" groove wheels which guide the machine on the same path as the guide side rail rolling surface. The wheel assemblies on the opposite side of the gantry are flat across the wheel face. This allows for thermal expansion and compliance between the machine and the rail system interfaced. The rail rolling surfaces are hardened and ground round shafting running the length of each rail providing a very durable long lasting support for the bridge.

Bridge Drive System

The bridge is driven along the rail system length by use of dual AC Servo motors (one on each side) coupled to low backlash planetary gear reducers. Helical rack and pinions are used to reduce cogging and vibration as normally witnessed when using straight rack and pinions. When combined in a system, AC servo motors and helical rack and pinion provide smooth motion and high acceleration rates, producing optimum plasma and oxy-fuel cut quality and accuracy.

AC servo motor

Low backlash planetary gear reducer



ball screw assembly

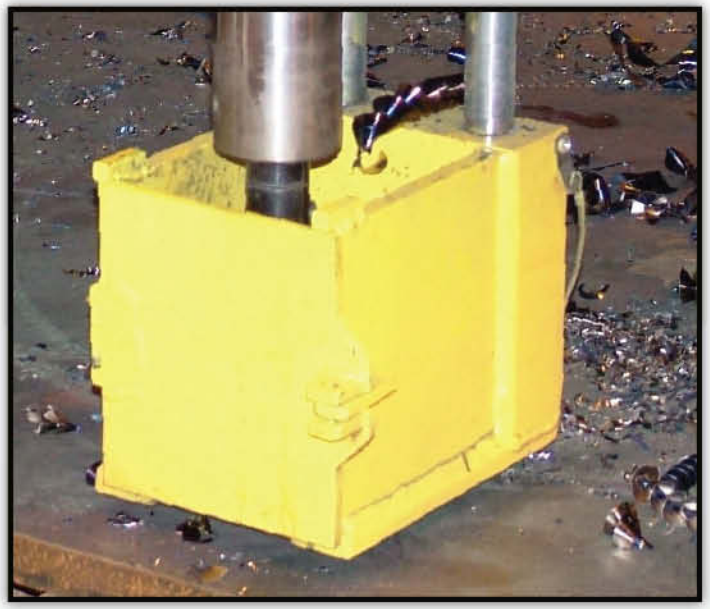
Spindle Rotation

The spindle rotation is produced by an AC Inverter Drive and matched motor drive through a 3:1 reduction using a timing belt. This allows the rpm to remain constant during feeding of the tool. This also achieves precise chip load when combined with the spindle feeding system. A steady chip load preserves the life of the tooling.

Spindle Feeds

The tool feeding system uses a precise closed loop AC servo control that drives a precision ball screw assembly. Velocity, torque, and position are all controlled at a 1 KHz sample rate. During the feeding cycle, the tool location is constantly monitored and updated by a series of complex algorithms sampling torque and change in position. This ensures that the tool is always drilling material and the tool is always protected.

The entire drill spindle assembly is attached and supported by precision preloaded linear guides and bearings. This increases the rigidity and accuracy of the tool as well as directs maximum usable horsepower at the tool cutting edges.



Chip Guard/Pressure Foot

At the beginning of every drill cycle, the chip guard/pressure foot extends down to the material surface. The chip guard/pressure foot keeps chips contained and holds thinner plate tight against the cutting surface. It also assists with stripping thinner material from the tool as the tool retracts after drilling.

Coolant

The cooling system for the drilling process is a high flow, through spindle design. This cooling system is comprised of pressurized air with an injected coolant mist spray. The coolant mist can be adjusted as desired. The coolant is routed through the tool and is introduced in front of the cutting edge of the drill bit.

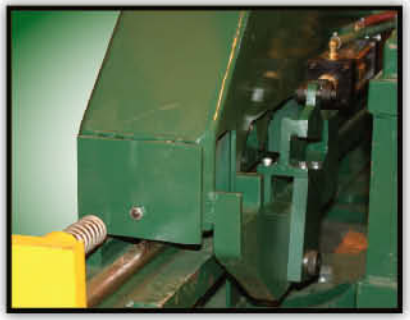
The advantages of this style of drill cooling system are that minimal coolant is used, it's not messy, it's easy to maintain, and there are no pumps or expensive return filtering systems required.

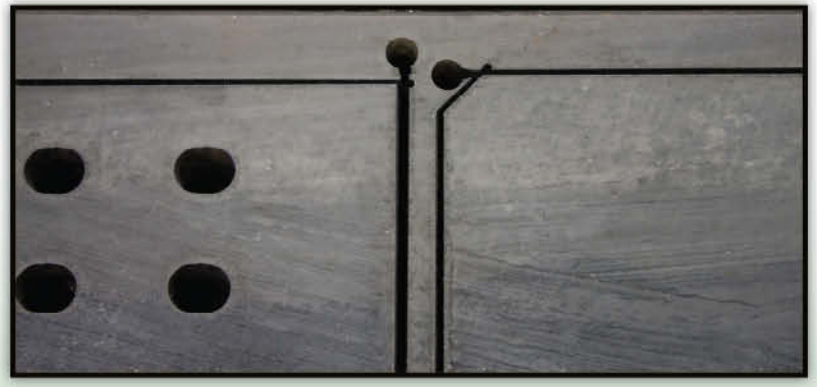
Position Locking Clamps

The position locking clamps hold the tool carriage and the entire bridge tight and rigid on their respective rails during every drilling cycle. Locking the carriage and gantry maintains tool life by eliminating vibration and holding positional accuracy.

Gantry guide rails

Bridge drive rail locking clamp



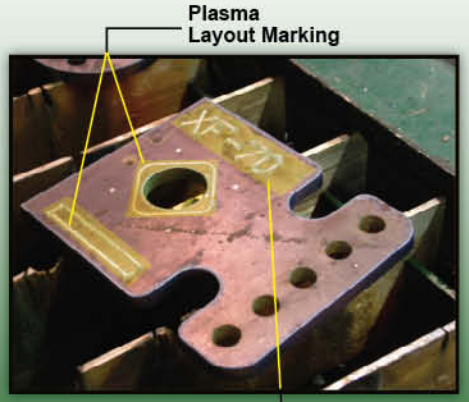


Pierce Pilot

The ***Pierce Pilot*** feature of the BTD-8X machine is an extremely useful tool. In short, it reduces the pre-heat cycle time for oxy-fuel cutting, it extends consumable life, and it maximizes the cutting capacity for the plasma cutting system. The BTD-8X machine software will automatically determine a location to place a drilled hole so that the cutting tool will initialize the pierce on the edge of the drilled hole. The center of the hole will be placed the tool radius distance away from the lead-in so that the edge of the drilled hole will be at the tip of the lead-in. After the hole is drilled, the cutting tool is positioned at the starting point for the part profile, it will fall centered on the edge of the drilled hole. What is important about this is the cutting process now has an edge to start on. The pierce time for oxy-fuel is reduced to seconds even on thick material, heavy blowback during piercing with either oxy-fuel or plasma is eliminated which extends consumable life. The plasma cutting capacity is increased to the manufacturer's recommendations for edge starting.

Layout and Part Marking

The Controlled Automation software communicates with the plasma automatic gas control to adjust the gas flows, gas pressures, and the amperage setting on the plasma. With this capability the system can place part marks for identification, create layout reference lines for component positioning in upcoming assemblies, place center marks required for future drilling or punching operations, or any surface marks desired on the material that will expedite secondary operations. The marking depth for this operation can be adjusted simply by changing the amperage setting or the travel speed of the tool.



Plasma Cutting

Hypertherm

The BTD-8X uses Hypertherm's HPR260 high definition plasma for its primary plasma cutting tool. This system can operate over a wide range of amperage settings (30 amp, 80 amp, 130 amp, 200 amp, and 260 amp). The HPR260 system can cut material from .018" thick all the way through 2-1/2" thick and will produce exceptional part edge quality. This plasma cutting system will produce a smooth part edge finish and dross free cut paths while steadily cutting at high speeds.

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Command THC

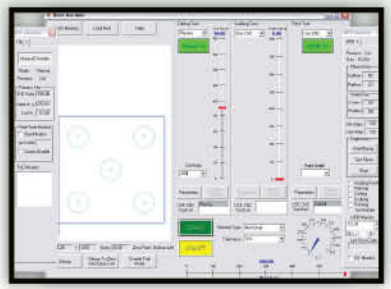
The Command THC, supplied by Hypertherm, is a microprocessor-based torch height control system which accurately sets the initial piercing height and controls the torch-to-work distance of a plasma torch during cutting operations. The system includes a control module, plasma system interface module, a torch lifter assembly, interconnecting cables, and a tool mount with collision detection.

Interface to the Controlled Automation controller

Both the plasma automatic gas control and the THC are interfaced to the Controlled Automation controller through an RS-422 port. The operator only has to select the material type, material thickness and the amperage, all the other dependent parameters are set automatically. This is comprehensive of the plasma, scribe, and point tools.

Plasma Automatic Gas Control

The plasma automatic gas control, supplied by Hypertherm, monitors and controls gas flows and pressures close to the torch for improved process consistency. The automatic gas control enables rapid switching from one gas cutting process to another or from the cutting process to the marking process.

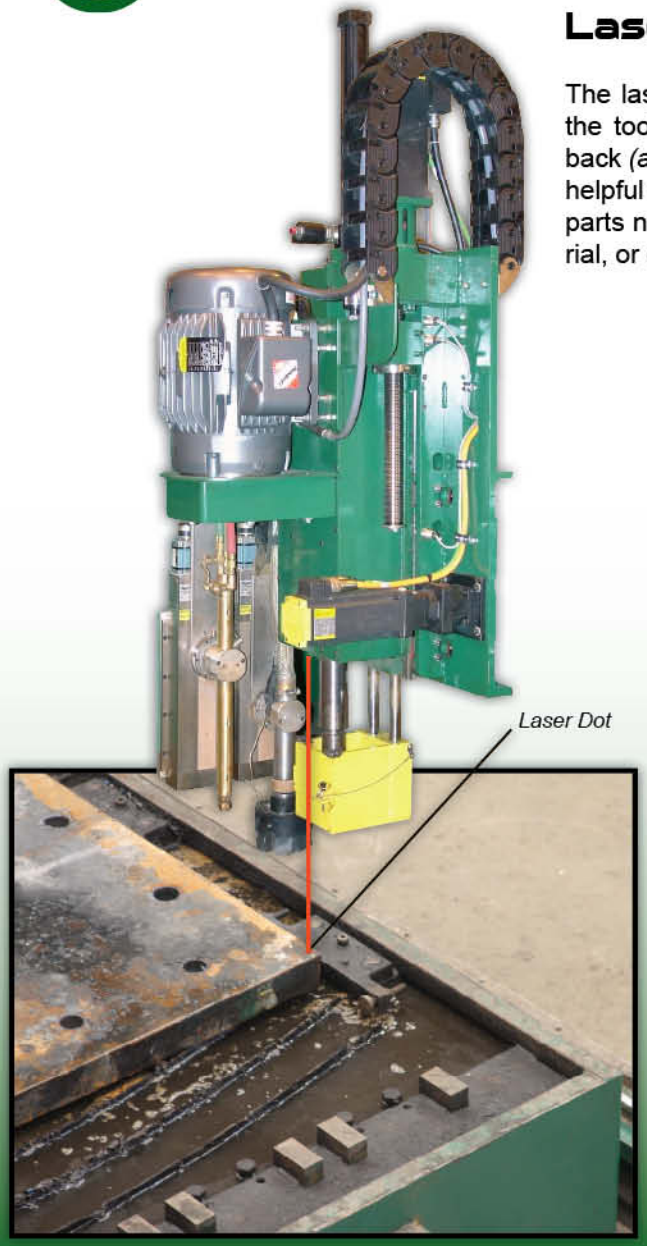


Oxy-fuel AutoGas

The oxy-fuel system automatically sets the gas pressures depending on the plate thickness and the torch tip being used. The automatic oxy-fuel gas pressure control system continually monitors the delivery pressures to the tool. Set-point information for the oxy-fuel autogas controller is stored in the machine control database. This information is used to adjust all pressures delivered to the cutting tool. A precision pressure transducer at each gas control regulator monitors the pressures for continuous real-time adjustments by the controller. With this continual monitoring system, pressures can be manipulated throughout the preheat and cutting cycle to set high preheat pressures during the preheat phase before the cut, lower pressure settings for the preheat which conserves fuel and oxygen during the cut cycle while improving edge quality, ramp the preheat pressures at an equal and steady rate over time to eliminate the risk of flame instability or blowout during the change, to set the desired cutting oxygen pressure, and ramp cutting oxygen pressure up over time during piercing to prevent molten blowback. These features are controlled and monitored to ensure a repeatable system that will reproduce part edge quality and cutting performance from day to day.

Oxy-Fuel

The BTD-8X is supplied with an oxy-fuel system for cutting thick plate. The operator can selectively use the plasma cutter or the oxy-fuel torch at runtime without changing the CNC file. The oxy-fuel system includes a machine gas service electric supply valve assembly, service hoses to the machine, automatic closed loop gas pressure control, control valves at the station, a totally enclosed lifter with upper and lower limit switches for over-travel protection, a tool mount with collision detection, an automatic torch ignition system, a cutting torch assembly, and of course, software to perform the system control.



Laser Dot

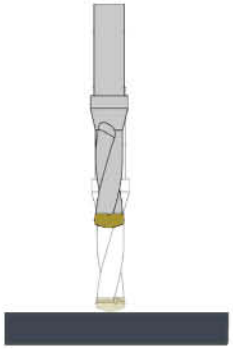
The laser dot is used to help the operator align the tools to the plate by supplying visual feedback *(a red laser dot)* on the material. This is very helpful when the operator is skewing a plate with parts nested very close to the edge of the material, or determining if a part will fit on a remnant.

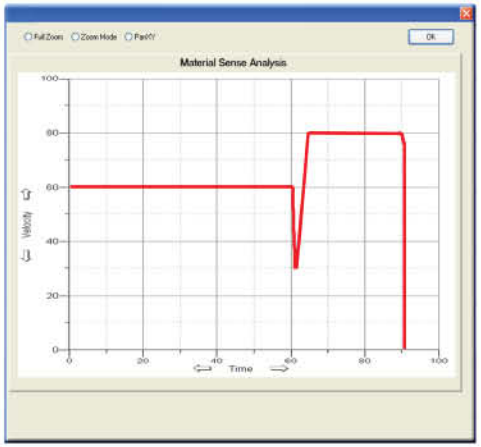
Bridge Wiring Track

The cable carrier flex track is totally enclosed with aluminum covers to protect the service hoses and wiring all along their length. The covers keep sparks and sharp drill chips out of contact with hoses and cables that continually move as the machine moves in length.

Oil/Water/Air Separator

The shop air cleaning system purpose is to filter oils, moisture, and debris from the shop's air supply. This system includes a mainline prefilter, then a refrigerated dryer, and finally a downstream micro mist separator. The separators are equipped with an internal automatic drain and a differential pressure indicator. Removing the water and oil from the air supply ensures the best possible performance of all pneumatic components, as well as ensuring the best possible cut quality and consumable life when using air as a plasma gas.





$$\lim_{h \to 0} \frac{f(x_0 + h) - f(x_0)}{h}$$

Bit Breakthrough Technology

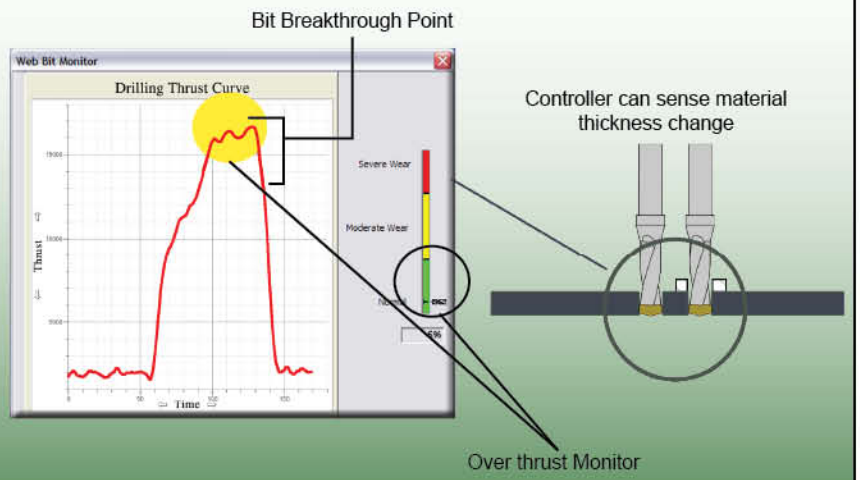
The BTD-8X software, using ***Bit Breakthrough Technology***, is able to determine when the drill bit has made it completely through the material. This can be performed for each hole making it possible to drill varying thicknesses on the same material. During this breakthrough event, the software adjusts the drilling parameters to protect the tooling from damage as the material stress is induced back into the bit.

Over Thrust Protection

With ***Over Thrust Protection*** technology, the control system limits and continuously monitors drilling thrust. A real-time feedback screen can be used to see drilling thrust and bit wear. If the tool has reached max thrust the control system will retract the tool and the user will be prompted to replace the tooling. This technology ensures the tool and tool holder will always be protected by limiting the thrust to the value specified by the tool database.

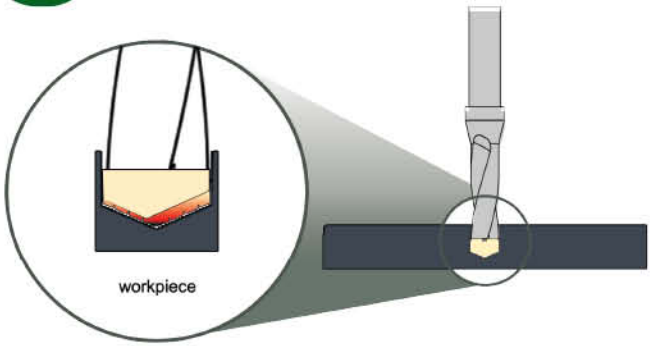
Soft Touch Material Sensing

The BTD-8X spindle feed has the ability to touch sense the material with the drill bit. This is done by rapidly advancing *(feeding)* the drill bit towards the material, sensing the drill bit contacting the material, and stopping the feed. The drill bit feed stops within .005 sec of contacting the material. This feature can be enabled for each hole, or can be set for the first hole only on a part run. This eliminates determining the exact drill bit length or using additional mechanical or electrical devices to locate the material surface. Tests have proven the machine can feed at 4"/sec with a 1/4" drill bit, sense the material and stop without damaging the bit.



Drilling Technology

Controlled Automation's unique drilling software is the product of years of research, development, testing, and experience in the structural steel fabrication industry. Advanced mathematical algorithms combined with high speed AC servo drives allow the software to use the drill bit as a sensing and cutting tool simultaneously. At any point in time the software knows the material surface location, bit depth, and drilling thrust. This allows the software to protect the drill bit from over thrust, and dynamically control the feed for varying material properties (hardness, chip load, chip evacuation).



Partial Hole Feed Correction

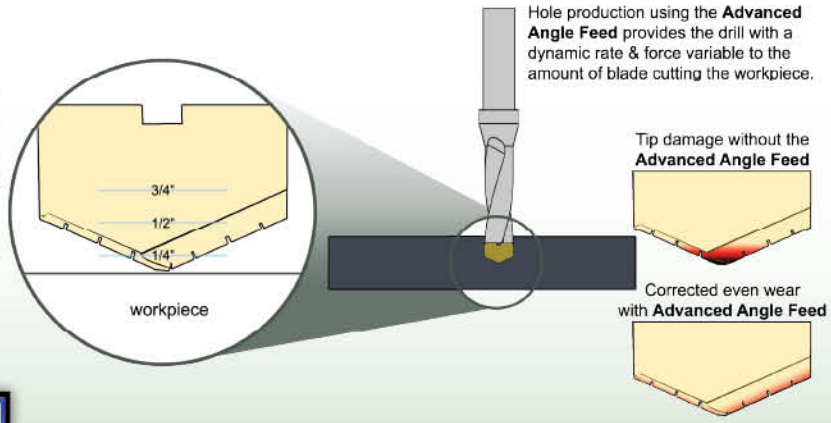
With the ***Partial Hole Feed Correction***, the control system will drill a previously unfinished hole with a special drill cycle that first senses the bottom of the hole with ***Soft Touch Material Sensing*** using a decreased thrust, then increases the rpm to clean out the hole. The drill cycle then returns to the normal drill cycle and finishes the hole at the proper feed and rpm. This protects the bit from an abrupt hit at the bottom of an unfinished hole and preserves tool life.

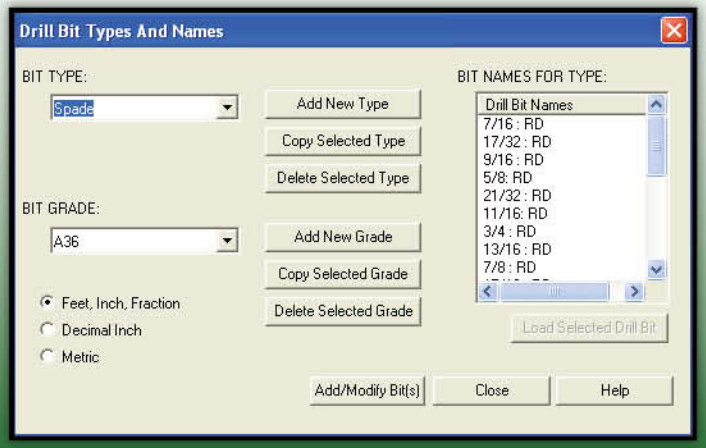
Drill or Burn Holes

The software has the ability to either burn a hole or drill a hole depending on the needs at the time. The operator can make final adjustments at the machine control if the requirements for holes within parts change for a job without having to modify the CNC file. This eliminates the need for reprogramming by office personnel who are creating nests for the machine. It also allows importing of existing machine files that contain burned hole profiles that now need to be drilled due to changes in standards or for various reasons.

Tip Angle Compensator

The rpm and feed rate controlled by the ***Tip Angle Compensator*** system allows for a more accurate start of the drill tip and maintains the chip load for the varying size tips of all drill tools. This provides an even distribution of the force and spin throughout the entire angle of the tip. The last part of the tool entering the surface of the work piece has the same wear as the starting point, saving the tools cutting edge quality throughout the initial feed of the tip angle.





Drill Tool Database

Our extensive ***Drill Tool Database*** provides users with a full list of bit types to choose from in conjunction with the material grade to ensure the most accurate usage and the longest possible tool life. All entries for drill tools are editable by the user in order to meet a higher demand of performance from the operation or to fine tune any new or existing tool product. The design of the machine allows for the widest selection of drill bit types including twist bits, spade bits, and carbide tooling.

Cutting Surfaces

Water Table

The water table work surface is designed to help reduce noise and smoke during the thermal cutting process using either plasma or oxy-fuel. The water level can be raised or lowered by supplying air to or exhausting air out of the built-in chamber in the bottom half of the table. The table is designed to withstand the forces during any drilling operation. The water table design also incorporates clamps to hold the material during high speed drilling. These clamps help reduce vibration by keeping the plate clamped tight to the water table. The water table may be supplied by Controlled Automation or manufactured by the customer using drawings supplied by Controlled Automation.

BTD-8X system

Requirements

Shop air requirements	120 psi @ 20 cfm
Electrical requirement	
	480 VAC 3 phase @ 29 FLA, 60 Hz
	380 VAC 3 phase @ 37 FLA, 60 Hz
	230 VAC 3 phase @ 58 FLA, 60 Hz
	208 VAC 3 phase @ 65 FLA, 60 Hz
	575 VAC 3 phase @ 23 FLA, 60 Hz

(All electrical and plumbing installation must meet state and local codes.)

Gantry

Rigidly constructed tubular steel gantry	
Approximate fully loaded gantry weight	7800 lbs

Gantry drive system

Dual AC servo	
Low backlash planetary gear reducers	
Helical rack & pinion	
Maximum travel speed	600”/min

Tool carriage

Approximate weight	1100 lbs
Crash detection on all cutting & marking tools purchased	

Carriage drive system

Low backlash planetary gear reducer	
Helical rack & pinion	
Maximum travel speed	600”/min
Material width capacity	8 foot *(2.5 meters)*

Rail system

Modules	10’
Maximum travel length	124’
Floor mounting/anchor pads every 2’ approximately	
Hardened rolling surface	
Totally enclosed cable carrier system to service machine	
Wiring and plumbing through cable carrier provided	

Drill spindle

Power	10 hp
Speed	300-1200 rpm variable
Tool holder	#4 morse taper
Minimum hole diameter	3/16”
Maximum hole diameter	1-9/16”
Minimum drillable material thickness	1/4”
Maximum drillable material thickness	2-1/2” production, 4” pierce pilot hole

Spindle feed

Ball screw	
AC servo	
Maximum thrust	2500 lbs
Linear guide block style support	
Maximum speed	4”/sec
Stroke length	11-1/2”

Coolant system

Coolant	high flow, through spindle mist
Coolant tank	7.5 gallon
Coolant type	VALENITE VNT-920 or HEM Turbo Drill
Low coolant level detection	

Oxy-fuel system

Customer to specify desired oxy-fuel torch brand	
Automatic gas pressure control	
Oxy-fuel torch assembly	
Emergency shut-off assembly	
Air dryer/moisture/oil separator	
Maximum material size	4” piercing start
Automatic striker/pilot flame system	
Air requirement	120 psi @ 1 scfm
	99.9% clean, dry & oil free
Oxygen requirement	120 psi @ 655 scfh *(per torch)*
Fuel gas requirement	15 psi @ 65 scfh (per torch)

(All specifications are subject to change without notice)

Plasma system

Supplier	Hypertherm
Model	HPR260 with automatic gas control
Cutting amperage range	30 - 260 amps
Torch height control	Command THC
Integrated marking	12 - 20 amps
Serial interface	RS-422 serial interface supplied
Material capacities	.018" thick thru 2-1/2" thick
Maximum piercing thickness recommended	1-1/4" thick
Air requirement	120 psi @ 2.5 scfm
	99.5% clean, dry & oil free (bottle recommended)
Oxygen requirement	120 psi @ 4.2 scfm
	99.5% pure oxygen (liquid recommended)
200/208 VAC 3 phase @ 149/144 50/60 Hz	
220 VAC 3 phase @ 136, 50/60 Hz	
240 VAC 3 phase @ 124, 60 Hz	
380 VAC 3 phase @ 84, 50/60 Hz	
400 VAC 3 phase @ 75, 50/60 Hz	
440 VAC 3 phase @ 68, 50/60 Hz	
480 VAC 3 phase @ 62, 60 Hz	
600 VAC 3 phase @ 50, 60 Hz	

Optional marking system

Supplier	Hypertherm
Air requirement	
	120 psi @ 6 scfm *99% clean, dry & oil free*
Electrical requirement	
	200 VAC 3 phase @ 8.3, 50/60 Hz
	208 VAC 3 phase @ 8.2, 60 Hz
	240 VAC 3 phase @ 7.9, 60 Hz
	400 VAC 3 phase @ 4.5, 50 Hz
	440 VAC 3 phase @ 4.2, 60 Hz
	480 VAC 3 phase @ 4.0, 60 Hz
	600 VAC 3 phase @ 3.3, 60 Hz

Work surface

Controlled Automation can supply, or provide the fabrication drawings for the buyer to manufacture their own.	
Air supply	.02 cfm @ 60 psi per ft^2 table area
Slats	aluminum or wood
Removable dross pans	5" fill capacity
Adjustable water level control	
Integrated aerator system	

Electrical distribution panel

Line voltage noise isolation provided by	
	Drive isolation transformer
	Constant voltage regulator
	Control voltage transformer
Fused disconnect for machine	
Fused disconnect for plasma	

Software

Version	SICAM-SCC controller software
Features	DSTV file import
	DXF file import
	Auto-nesting
	Shape library
	Hole database
	Computer
	Networkable
	Common line cutting
	Automatic cutting process parameter setup
	(kerfs, speeds and delays)

Automatically set through the serial interface

Pierce time
Initial height
Retract height
Arc voltage *(torch to work distance)*
Amperage *(cutting or marking)*
Corner amperage reduction
Gas control *(cutting or marking)*

For more complete information on this or any of our machines, contact our sales department at 501-557-5109 or sales@controlledautomation.com

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Controlled Automation specializes in the manufacture of automated structural steel drilling, punching, and shape cutting machinery. We also build material handling systems to complement each type of machine we offer. As well as new machinery, we are the industry leader in retrofitting control systems and remanufacturing existing structural steel fabricating machinery. All machines and controls are designed and manufactured entirely in the United States of America. All software is developed and supported in the United States of America.

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