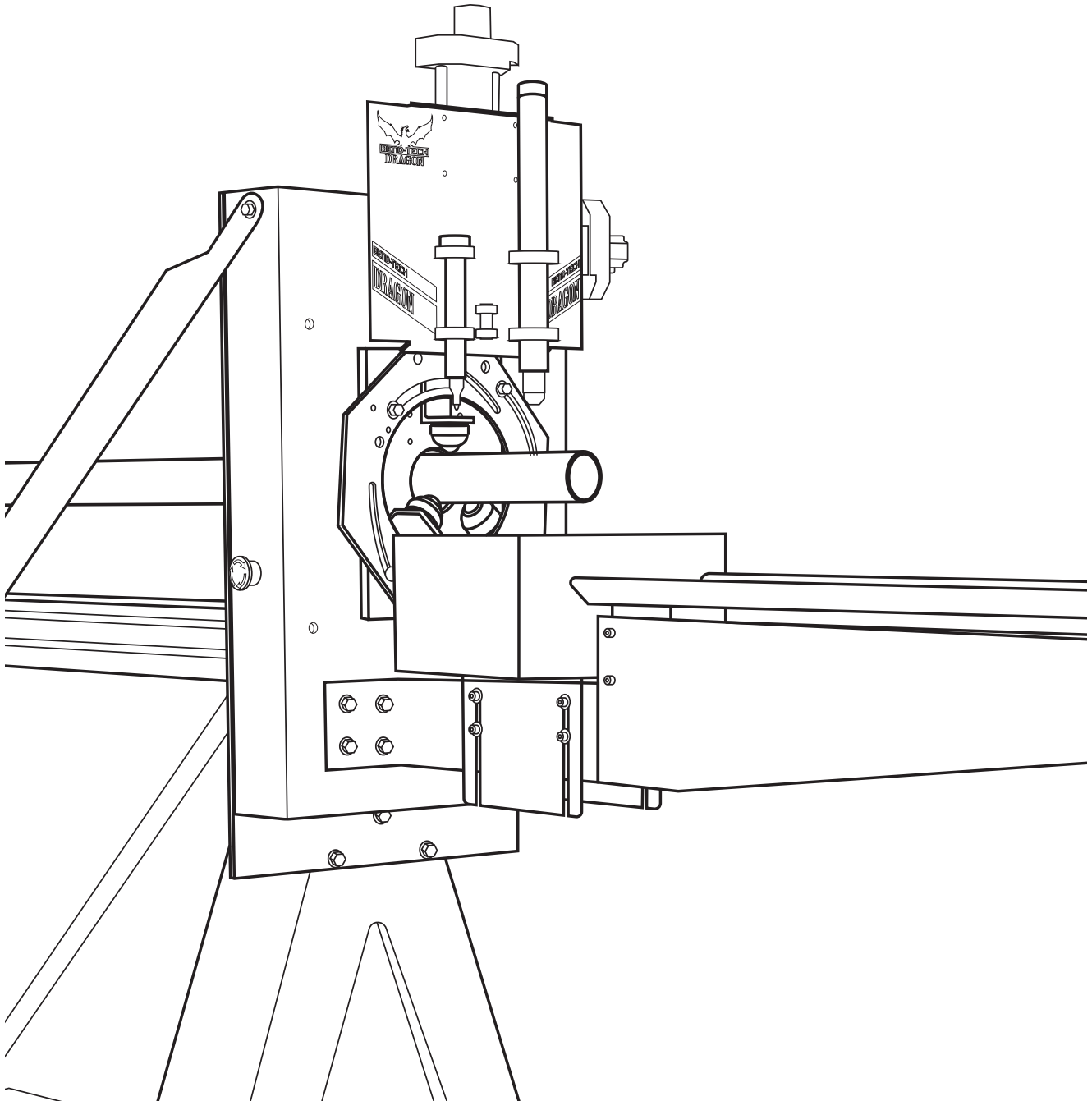


Part 1 of 3

# BEND-TECH DRAGON A250

## Startup and Training Manual Part 1: Safety and Maintenance



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# **Dragon A250**

## **Startup and Training Manual** Revision 1

English  
Original Instructions

December, 2020

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# ***Limited Warranty***

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## **Covering Bend-Tech Dragon**

Bend-Tech, LLC provides a limited warranty on all new Dragon machines that are manufactured directly or under license by Bend-Tech, LLC, and sold by Bend-Tech, LLC or its approved distributors.

## **Warranty Coverage**

Each Bend-Tech Dragon machine is warranted by the manufacturer against defects in material workmanship for 12-months. The warranty period commences upon delivery of the Dragon machine to the customer's facility.

## **Repair or Replacement Only**

The Manufacturer's sole liability, and the Customer's exclusive remedy under this warranty shall be limited to repairing or replacing the defective part. Repair or replacement of parts is at the sole discretion of the manufacturer. The Customer is responsible for warranty parts installation. Bend-Tech does not provide warranty service labor.

## **Limits**

This warranty does not cover components subject to wear due to normal use of the machine such as belts, lights, tooling etc. This warranty is void if Bend-Tech, LLC has determined any failure is the result of mishandling, abuse, misuse, improper installation, improper storage, improper maintenance or unauthorized modification of the machine. The warranty does not cover damage due to natural disasters, fire, flood or other external factors. The warranty may become void or limited in the event that hardware changes or adaptations are made to the machine.

## **Software**

Dragon software is covered by a 2-year maintenance plan from the purchase date of the Dragon machine. After the 2-year maintenance plan is expired, the Customer can purchase a maintenance plan. A maintenance plan will ensure the customer always has the newest version of Dragon software. The maintenance plan is critical to keeping Dragon software updated with the newest capabilities possible, and is critical to the servicing of the machine. Bend-Tech, LLC will contact the Customer regarding updates to the maintenance plan within 1-month of expiration. Contact Bend-Tech Support to ensure software is up to date: support@bend-tech.com.

# Customer Service

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Any questions or concerns regarding this manual can be directed to Bend-Tech, LLC representatives via the Dragon website, [www.bend-tech.com](http://www.bend-tech.com). Click Contact in the menu bar for communication options and send your comments to the Dragon Customer Service department.

## Online Resources

- <https://www.youtube.com/user/bendtech2020>
- <http://www.bend-tech.com/wiki7>
- <http://www.bend-tech.com>
- <https://www.facebook.com/2020ssi>
- [https://www.instagram.com/bend\\_tech](https://www.instagram.com/bend_tech)

# Customer Satisfaction Commitment

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Congratulations on your purchase of the world's best CNC plasma tube and pipe cutting machine, the Bend-Tech Dragon. Bend-Tech, LLC places great pride in customer satisfaction and it is our promise to offer you the best support available for your Dragon. We recognize that our support is a key factor in your success.

## Contact Us

Bend-Tech's hours of operation are Monday - Friday, 8:00 - 5:00 EST. The Bend-Tech support team and sales team are always available during our hours of operation.

**Phone:** 651-257-8715

**Email:** Sales team: [sales@bend-tech.com](mailto:sales@bend-tech.com)  
Support team: [support@bend-tech.com](mailto:support@bend-tech.com)

**Address:** Bend-Tech, 729 Prospect Ave., Osceola, WI 54020, U.S.A..

# Warnings

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This manual contains important statements that are called out from the regular text with an associated signal word: “Danger,” “Warning,” “Caution,” or “Note.” Each of these signal words is accompanied by its own icon. These signal words and icons indicate the severity of the condition and the warning. The machine operator should familiarize themselves with these warnings and read the statements before operating the machine.

## Definitions & Examples

### Danger

Danger indicates a serious condition that could cause severe injury or death to the operator or bystanders if the instructions are not followed.

#### Example

## ! Danger !



Exceeding the material weight limit of the Dragon A250 can result in serious injury to the operator and/or bystanders.

### Warning

A Warning indicates there is a possibility for minor injury if the instructions are not followed correctly.

#### Example

## ! Warning !



Due to the extreme temperatures that result from the plasma cutting process, parts cooled in water in the parts catcher can still be extremely hot. Always use caution when handling newly-cut parts.

## Caution

Caution warns the operator that minor injury or machine damage could occur if instructions are not followed. It could also mean that not following directions could affect the overall procedure being performed.

### Example

## ! Caution !



Exceeding the material weight limit can affect performance and possibly damage the Dragon A250.

## Note

A Note gives clarification or focuses on information that is critical or unique to an operation.

### Example



The Dragon A250 Material Coolant System greatly reduces smoke and vapor emitted by the machine. Bend-Tech recommends use of the Material Coolant System whenever possible. The Coolant System is especially effective when working with aluminum or stainless steel.

# Glossary

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## Axis

A fixed reference line used by the Dragon A250.

## Bend-Tech 7x

Machine design software - CAD.

## BOB

Breakout Board.

## Material Support Lift

The Material Support Lift supports material to reduce sag.

## Chuck

Located on the Trolley, the Chuck holds the material so it can be moved forward, backward and rotated.

## Control Box

Connects Dragon Software Suite to the Dragon A250.

## Coolant Tray

Cools cut parts as they are produced.

## E-Stop

Emergency stop.

## ESS

Ethernet Smooth Stepper (Control Board).

## Ethernet

System for connecting multiple computers via a Local Area Network.

## Gate

The Gate supports the material at the front of the machine. It consists of two sets of self-centering roller jaws.

## Interface

Any particular screen display generated by Bend-Tech software.

## Mach3

Machine driver software.

## Parts Catcher

The parts catcher is placed at the front of the machine to catch parts as they are cut.

## Rack & Pinion

The rack and pinion gear assembly is the method that drives the horizontal movement of the Trolley.

## Rail & Beam

The Beam is the main structure of the Dragon A250. the rails are attached to the beam and guides the Trolley.

## Tail

The Tail is located at the opposite end of the Head of the machine. The Tail arrives pre-assembled. The X Axis homing sensor, rear E-Stop are located at the Tail of the machine.

## Toolhead

Operates the Marker, Engraver and Torch.

## Trolley

The Trolley rides on the Rail, and carries the Chuck forward and backward along the length of the Rail Support Beam.



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# 01 Safety

## 1.1 General Safety Notes

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Read all warnings, cautions and instructions before operating the Dragon machine.

Each company has different procedures. Always act in accordance with Environmental Health & Safety (EHS) standards set in place regarding the facility in which the Dragon A250 is being operated.

Follow basic safety precautions to reduce the risk of injury or mechanical damage. CNC metal working machines such as the Bend-Tech Dragon machines introduce hazards to the workplace. It is the responsibility of the Operator to take appropriate safety measures regarding the potential hazards of this machine, and not the responsibility of Bend-Tech, LLC.

Maintaining a clean machine is important during normal use as well as prior to and after servicing the machine. Cleaning procedures may require Personal Protective Equipment (PPE) beyond the scope of daily operation procedures of the machine.

Read the Startup and Training manual in its entirety to ensure safe and efficient operation of the Dragon A250 machine.

This manual is a reference guide for the Dragon A250 and is not a comprehensive source of operating or training information. A complete training course and support can be requested from Bend-Tech at [www.bend-tech.com](http://www.bend-tech.com).

## **! Caution !**



The Dragon A250 should only be operated by authorized and trained personnel. The operator should always act in accordance with the Dragon A250 Startup and Training safety procedures and machine instructions for safe operation of this machine. Failure to follow these guidelines may pose a hazard to personnel and the machine.

## **1.2 Safety Procedures**

---

### **1.2.1 Personal Protective Equipment (PPE)**

Metalworking and metalworking operations can be dangerous. Using the proper PPE is important to avoid injuries that can result from sparks, heat, noise, smoke and vapor, dropped objects, and ultraviolet light. Consult local safety codes before operating the machine. Before working on or near the machine, it is important to read this manual and fully understand the safe operation of the machine. Contact Bend-Tech with any questions or concerns regarding the safe operation of the Dragon A250.

## **1.3 Recommended PPE for Operating the Dragon A250**

---

### **1.3.1 Ultraviolet Eye Protection**

Safety glasses with the proper shade based on the amperage of the Torch are required for operation of the machine. It is important the operator and anyone observing the machine wear welder's glasses or a welder's mask, or the machine be surrounded by a welding curtain. Refer to Occupational Safety and Health Administration (OSHA) standards to determine proper safety glass shading and/or welding curtain for the cutting torch amperage being used.

## **! Danger !**



The cutting torch emits ultraviolet light. Looking directly at the plasma arc can damage human retinas.

### 1.3.2 Footwear

The Dragon A250 is a metal working machine and metal materials can be extremely heavy. A piece of dropped material could cause injury to the operator or observers. Also, the torch emits sparks and possibly hot torch slag. It is highly recommended that the operator wear safety shoes or boots while operating the Dragon A250.

### 1.3.3 Heat-Resistant Gloves

Parts produced by the Dragon will be extremely hot and could cause severe burns if not handled properly. It is recommended that the operator wear heat-resistant gloves when handling parts produced by the Dragon A250.

## ! Warning !



Due to the extreme temperatures that result from the plasma cutting process, parts cooled in water in the parts catcher can still be extremely hot. Always use caution when handling newly-cut parts.

### 1.3.4 General Eye Protection

The Dragon A250 will emit sparks, plasma dust and slag during operation. Anyone operating or observing the machine should wear the appropriate eye protection.

### 1.3.5 Hearing Protection

While the Dragon A250 is relatively quiet, it is recommended that the operator wear hearing protection as specified per the facility safety requirements.

### 1.3.6 Breather Mask or Ventilation System

Plasma dust and debris is toxic, and inhalation can cause respiratory difficulties or other complications. It is recommended that the operator and any observers wear a breathing mask, or that the shop be equipped with an effective ventilation system for safe operation of the Dragon A250.



The Dragon A250 material coolant system greatly reduces smoke and vapor emitted by the machine. Bend-Tech recommends use of the material coolant system whenever possible. The coolant system is especially effective when working with aluminum or stainless steel.

## 1.4 Operational Safety

---

### 1.4.1 Guards

Do not operate the machine without safety guards in place.

### 1.4.2 Machine Walkthrough

Perform an inspection walkthrough of the machine before each startup, making sure all electrical cords and cables that function as part of moving assemblies are secure and fastened. Ensure all tools are fastened securely. Ensure all E-Stop switches are disengaged.

### 1.4.3 Machine Operational Movement

While a program is running, the trolley and toolhead can move rapidly at any time through its short/long travel feed rate procedures. The operator and bystanders should stay clear of the Trolley and Toolhead during machine operation.

## ! Warning !



The trolley, toolhead, and gate are pinch points. Stay clear during machine operation.

### 1.4.4 Material Securing

Ensure that any material loaded into the machine is securely fastened in the chuck and is snug in the gate.

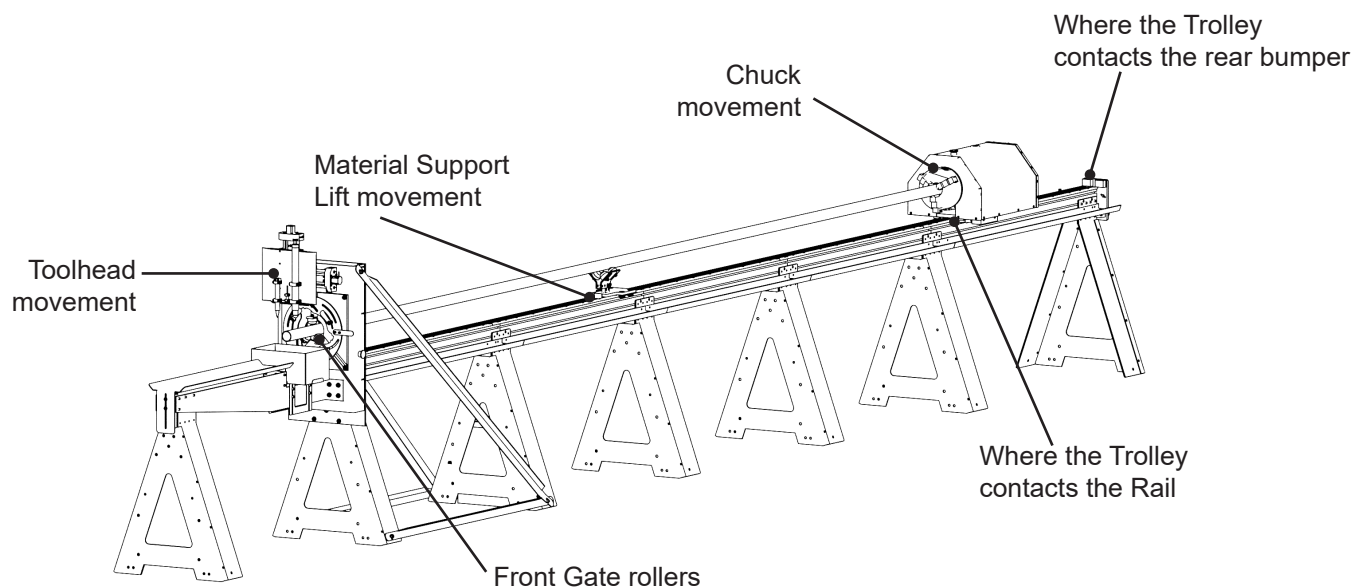
## ! Warning !



Improperly secured material may cause injury.

## 1.5 Pinch Points

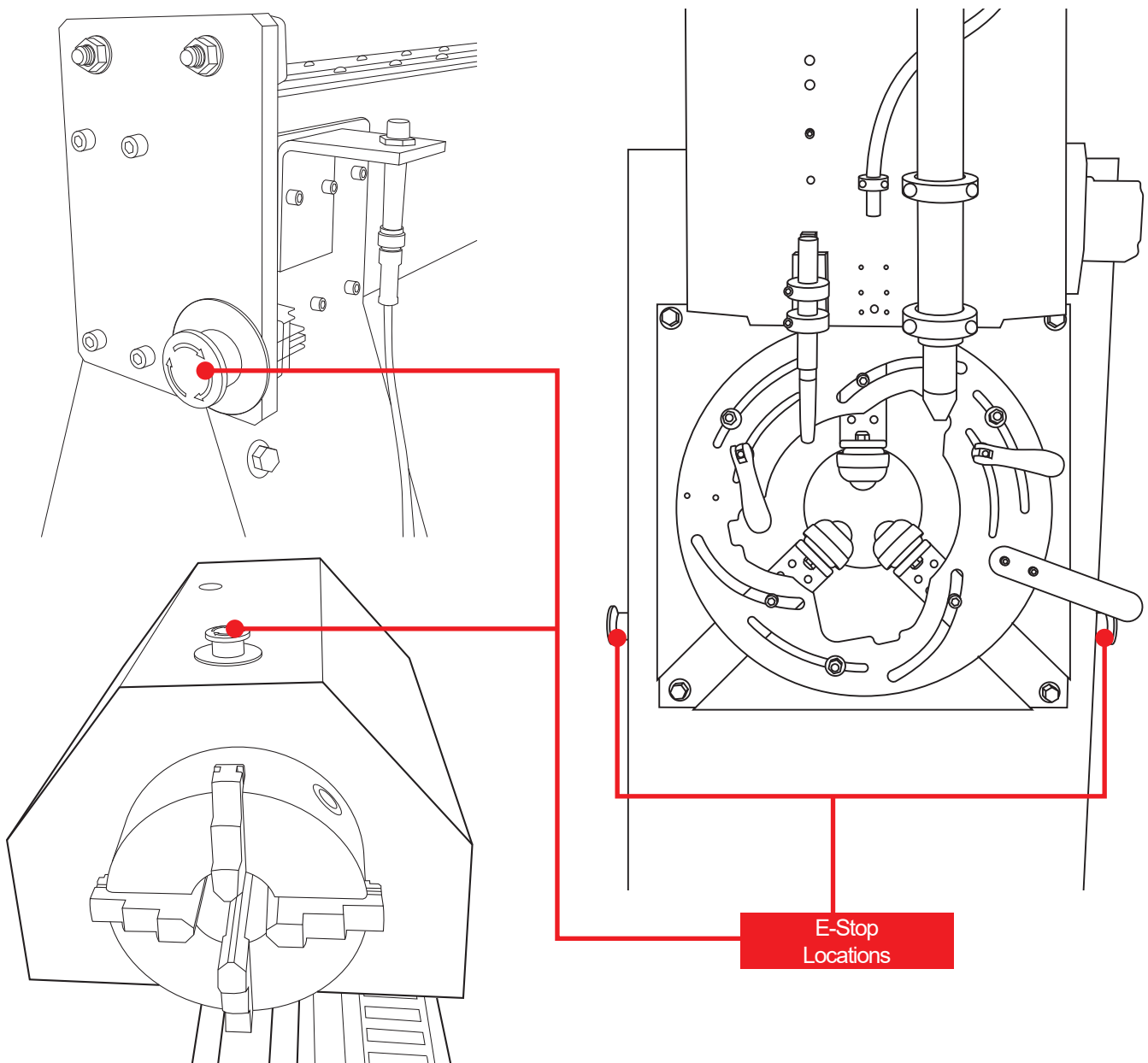
Use caution in the area of pinch points. There are many pinch point locations identified on the Dragon A250 including the gate assembly, toolhead, trolley and material support lift. It is advised to use caution in these areas and stay clear of them during machine operation.



## 1.6 Emergency Stops (E-Stops)

### 1.6.1 E-Stop Overview

There are four external emergency stop (E-Stop) buttons located on the Dragon A250 machine. There is one E-Stop on the tail of the machine, one on the trolley cover, and one on each side of the Gate. These four emergency stops completely shut power off to all motors and outputs. To re-enable the machine after pressing an E-Stop, the E-Stop must be disengaged and power to the motors must be initialized by pressing the green light on the Control Box. If the green light doesn't initialize, this is an indicator that an E-Stop is still engaged. The green light indicates the motors have power.





## 1.6.2 Control Screen E-Stop

There is an additional emergency stop located on the machine control screen. This E-Stop doesn't cut power to any motors or outputs, but will temporarily disable any software that is being used. This will stop any project that is being run, without disconnecting power to the motors.

## 1.6.3 Re-Home after an Emergency Stop

When an E-Stop is engaged, the machine will need to be re-homed after the E-Stop is cleared and disengaged.

# 17 Electrical Servicing

## 1.7.1 Power Down Before Servicing

Completely power off the control box before handling any electrical components. Electrical components include all motor connections, motor cables, sensors, sensor cables, emergency stops, laser cable, and Torch cable.

### ! Danger !



Do not touch 120VAC components inside the control box without first disconnecting the machine from its power source.

### ! Warning !



Never disconnect a motor cable with power applied.

## 1.8 Material Weight

---

### 1.8.1 Weight Limit

Material weight limit for the Dragon A250 should not exceed 260 lbs. This is the maximum weight of material the trolley can support while still operating safely.

### **! Danger !**



Exceeding the material weight limit of the Dragon A250 can result in serious injury to the operator and/or bystanders.

### **! Caution !**



Exceeding the material weight limit can affect performance and possibly damage the Dragon A250.

## 1.9 Material Length

---

### 1.9.1 Material Support Lift

Some non-rigid materials, or excessively long materials, can sag and cause material to raise at the toolhead, introducing the danger of material contacting and damaging the torch. Material longer than 10 ft. or thinner material may need to be supported by the material support lift in order to avoid contacting the torch.

## 1.10 Plasma Torch

### 1.10.1 Torch Overview

The torch and plasma cutting unit is a high-voltage system that requires extreme caution when operating. It is recommended that the operator read the Hypertherm manual and become familiar with the hazards of working with the plasma unit before operating it in conjunction with the Dragon.

### 1.10.2 Ultraviolet Light

The torch emits extreme ultraviolet light which can damage human retinas. Never look directly at the torch arc without the appropriate eye protection.

#### The minimum ANSI eye protection recommendations:

- Less than 40 amps - shade 5
- 41 to 60 amps - shade 6
- 61 to 300 amps - shade 8

### 1.10.3 Heat

The torch will introduce extreme heat into the material during the cutting process. The operator should take caution handling newly-cut parts. Always wear heat resistant gloves when handling parts after cutting.

## ! Danger !



The plasma arc of the torch can cause severe injury or even death. Never approach the torch while it is activated and operating.

### 1.10.4 Gloves

Always wear insulated gloves when handling torch consumables. Consumables get extremely hot during torch operation. Touching torch consumables can result in electric shock if the torch is not disabled before handling.

### 1.10.5 Fumes

Some metals, including stainless steel, can emit toxic fumes when cut. Bend-Tech recommends using a ventilation system with the Dragon A250 or ensure the facility has adequate ventilation to ensure air quality meets standards and regulations.

## ! Danger !



Servicing the plasma unit with power connected can result in electric shock which can lead to severe injury or death. Disconnect power before servicing the torch or plasma unit.

## ! Danger !



Do not use combustible fuel gases or oxidizing gases in the plasma cutting process. Use of these types of gases can result in explosive conditions during cutting operations.

## 1.11 Modifications To The Machine

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### 1.11.1 Unauthorized Modifications

Performing unauthorized modifications to the Dragon A250 is not recommended. Bend-Tech, LLC is not responsible for damage resulting from modifications to the Dragon A250.

Unauthorized modifications include modifications to the machine's G-code that alter the factory settings and adversely affect the operation of the machine.

### 1.11.2 Factory Parts Kits and Updates

Some parts kits and update packages are manufactured and sold by Bend-Tech, LLC. Customers may choose to install these kits and updates themselves. However, the customer should have a thorough understanding of the machine and the service actions being performed. If a customer has any doubts regarding their ability to install parts kits or update packages contact Bend-Tech for assistance.

## **! Caution !**



Bend-Tech does not recommend unauthorized modifications to the Dragon A250. Contact Bend-Tech service representatives with any questions regarding operation or capabilities of the machine.

### **1.12 Other Safety Information**

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The Dragon A250 may have subassemblies supplied with independent warnings. It is the operator's responsibility to familiarize themselves with all possible hazards of the machine.

### **1.13 More Information**

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Bend-Tech is continuously updating information regarding the Dragon A250. Users can see updated and supplemental information online at [www.bend-tech.com](http://www.bend-tech.com) or talk to a technical representative directly by calling 651-257-8715.

### **1.14 Recommended Safety Guidelines**

---

- Keep unauthorized personnel away from the Dragon A250 work area.
- Keep the work area clean and free of debris.
- Stay clear of the machine and any moving parts during machine operation.
- Stay clear of the toolhead during operation.
- Never operate the machine while under the influence of alcohol or drugs.
- Wear appropriate PPE at all times while operating the machine.
- Keep flammables away from the machine during operation.
- Risk of electric shock - avoid touching exposed wires while the machine is powered.
- Always power off the machine and disconnect from main power source before servicing electrical components.
- Do not exceed the machine's capacities.
- Do not wear loose-fitting clothing or jewelry while operating the machine.
- Be aware of sharp edges on cut material.
- Avoid handling hot parts.



# 02

# Maintenance

## 2.1 Dragon A250 Maintenance Overview

---

In order to keep the Dragon A250 running at peak performance, it is important to follow the maintenance schedule. Following this maintenance schedule will help maximize the machine's long-term welfare and avoid down time. The plasma cutting process produces dust, slag smoke and other contaminants that, over time, can build up on Dragon A250 components. If not maintained, these contaminants can affect the performance of the machine.

The Dragon A250 is a machine which relies on mechanical components to perform its operations. As with any machine, these components can wear out over time. Maintaining them is key to maximizing the service life of the machine.

## 2.2 Daily Maintenance

---

The Dragon A250 requires specific daily maintenance in order to continue to function like new. The Operator should set up a Daily Maintenance checklist that includes all of the points outlined in this section.

### 2.2.1 Clean the Gate

The Gate will see an extreme amount of plasma dust buildup under regular use. There are many precision moving parts in the Gate and keeping it clean is critical. Use compressed air to blow dust and debris from the rollers, bearings and other components. Gate rollers should not be lubricated. If they are kept clean they should work as designed.

### 2.2.2 Clean the Rail

Clean the Rail using compressed air to blow any dirt or debris that may have accumulated. After blowing clean the Rail can also be wiped down with a clean rag.

### 2.2.3 Clean the Rack

Check the Rack for debris buildup and clean with compressed air. If the compressed air strips the lubricant from the racks, re-lubricate them with WD40 Specialist Spray & Stay Gel Lubricant.

### 2.2.4 Check the Coolant Level

For Dragon machines equipped with a material cooling system, verify that the level of coolant is adequate. Coolant can be clean water or other coolants, such as anti-rust solutions.

### 2.2.5 Clear the Part Catcher

Remove any loose parts from the parts catcher. Clean the parts catcher of slag and debris. If necessary, add water to the parts catcher.

### 2.2.6 Check the Air Pressure

Check the air pressure at the air inlet on the control box. Pressure should be within the recommended 100-130 psi range.

### 2.2.7 Clean the Work Area

It is important to keep the work area surrounding the Dragon A250 clean and free from dust and safety hazards. Sweep the work area regularly and remove any debris that may be around the machine.

### 2.2.8 Check the Plasma System

Refer to your plasma system maintenance guide regarding scheduled maintenance and procedures.

## 2.3 Weekly or Every 40 Hours

---

Each week or 40-hours of runtime, the Dragon will require additional maintenance. Maintenance in this section should be combined with maintenance outlined in section 2.2: Daily Maintenance.

### 2.3.1 Clean Grease and Oil Buildup

Wipe off any excess grease, oil or grime that may have accumulated on the machine.



### 2.3.2 Check Electronic Connections

Inspect all electrical connections. Perform this inspection with the machine powered off, and disconnected from power sources. Ensure all electrical connections are hand tight and in good working order.

### 2.3.3 Clean Chuck and Trolley

With a clean rag, clean the chuck and trolley of the machine.

### 2.3.4 Lubricate the Gear Rack

Clean and lubricate the gear rack with WD40 Specialist Spray & Stay Gel Lubricant.

## 2.4 Monthly or 150 Hours

---

Monthly maintenance should be performed each month or after 150-hours of service time. Scheduled monthly maintenance should include all previous maintenance procedures outlined.

### 2.4.1 Check the Fasteners

Perform a comprehensive check of the machine verifying that all fasteners are present and secure. Ensure all fasteners are appropriately tightened. Replace missing or damaged fasteners.

### 2.4.2 Clean and Fill the Material Cooling System Reservoir

For machines equipped with a material cooling system, drain and refill the system to the proper level. Fill the reservoir with clean coolants.

### 2.4.3 Check the Eccentric Bearings

Verify the eccentric bearings on the trolley and the gate are adjusted properly. Ensure that the eccentric bearings roll smoothly and there is no play.

### 2.4.4 Check the Emergency Stops

Inspect the E-Stop buttons for loose wire connections and proper operation. Check that each E-Stop is functioning correctly. When an E-Stop is triggered the green power light will turn off.

### 2.4.5 Clean and Lubricate the Racks

Clean the gear racks and re-lubricate with WD40 Specialist Spray & Stay Gel Lubricant.

### 2.4.6 Check Backlash

Check backlash in X-Axis. Adjust if necessary.

### 2.5 Quarterly or 500 Hours

---

Quarterly maintenance should take place every three months or after 500-hours of operation. Quarterly maintenance should include all previous maintenance procedures outlined.

#### 2.5.1 Clean Coolant Screens

For machines equipped with a material cooling system, inspect and clean the system screens.

#### 2.5.2 Grease Pillow Block Bearings

Reapply grease to the pillow block bearings on the trolley. Bend-Tech recommends hi-temp red lithium grease, NLG12.

#### 2.5.3 Comprehensive Cleaning

Clean entire machine.

#### 2.5.4 Clean and Grease Actuators

Grease actuators with a light coating of NLG12 grease. Ensure Actuators are clean before applying grease.

### 2.6 Bi-Annually or 1000 Hours

---

Bi-annual maintenance should take place every six months or after 1000 hours of operation. Bi-annual maintenance should include all previous maintenance procedures outlined.

#### 2.6.1 Clean the Chuck

Remove the chuck, disassemble jaws and clean. Ensure the teeth are reinstalled in the proper location and in the proper order.

#### 2.6.2 Check Level and Straightness

Check to ensure the Rail is level and adjust as necessary. Check the Rail for straightness using the string provided with the machine. See Startup and Training Manual Part 2.

### 2.7 Annually or 2000 Hours

---

Annual maintenance should take place each year or after 2000 hours of operation. An annual or 2000 hour maintenance procedure centers around checking the backlash in the drive motors and gears. It should also include all previous maintenance procedures outlined.

#### 2.7.1 Check Rack Spacing

Check the Rack spacing. Adjust if necessary.

## **Attention**

After completing Startup and Training Manual Part 1, please proceed to Startup and Training Manual Part 2.

**Bend-Tech, LLC**

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