LASER_TUG

Rod Feeder for IPG LightWeld Handheld Laser Welders

User Manual — Version 3

Cascade InnoTech

Technical Support

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1. Introduction

1.1 Product Overview

The LASER_TUG is a motorized rod feeder that mounts directly to IPG LightWeld Handheld Laser Welders. It enables automated feeding of straight-length filler rods up to 0.125" (3.18 mm) in diameter using a high-torque direct-drive stepper motor.

The control box synchronizes wire feed motor operation with the handheld laser's main trigger — automatically starting and stopping feed in response to trigger input.

Figure 1. LASER_TUG rod feeder mounted to IPG LightWeld handheld laser welder

> ℹ️ **Nozzle Tip Recommendation**
>
> • For optimal wire alignment, use a single-point nozzle tip with a wire groove channel, similar to those used with spool-box wire feeding systems.

1.2 Product Specifications

Parameter	Value
Power Supply	12V DC, 5A
Feed Rate Range	0 – 150 in/min (0 – 381 cm/min)
Feed Rate Resolution	0.24 in/min (0.60 cm/min)
Maximum Rod Diameter	0.125" (3.18 mm)

Parameter	Value
Duty Cycle	20%
Motor Controller	ZK-SMC02 Stepper Motor Controller
Recommended Drive Current	1.0A
Drive Mode	F-01 P02 (Momentary CW Drive)
Mounting	IPG LightWeld Handheld Laser Welder

1.3 Technical Support

For questions, troubleshooting assistance, or warranty inquiries, contact:

Email: LaserTug@CascadeInnoTech.com

2. Safety Information

Read and understand this entire manual before operating the LASER_TUG. Failure to follow safety guidelines may result in personal injury, equipment damage, or compromised weld quality.

2.1 General Safety

- Use the unit only for its intended purpose as described in this manual.
- Keep hands, loose clothing, and tools clear of all moving parts during operation.
- Ensure all electrical and mechanical connections are secure before powering on the device.
- Keep drive gears clean and free of debris at all times.
- Operate only in a well-ventilated, dry environment.

2.2 Electrical Safety

- The unit requires a 12V DC, 5A power supply. Do not use a power source that does not match these specifications.
- Do not modify or bypass the control box, wiring, or power supply.
- Inspect all power cables and connectors for damage before each use. Do not operate with frayed or damaged wiring.
- Disconnect power before performing any maintenance, cleaning, or mechanical adjustment.
- Protect all electrical components from moisture to prevent damage and shock hazards.

2.3 Pinch Point Hazard

> ⚠ **Pinch Point — Keep Clear of Drive Gears**
>
> • The drive gear wheel presents a pinch point hazard. Never place fingers, gloves, or objects near moving gears during operation.
>
> • Always disconnect power and allow all moving parts to come to a complete stop before performing maintenance.
>
> • If a jam occurs, disconnect power before attempting to clear the obstruction.

2.4 Personal Protective Equipment

- Wear appropriate work gloves when handling welding wire to prevent cuts and punctures.
- Use safety glasses or a full face shield to protect against wire whip or debris.
- Do not wear loose clothing, jewelry, or accessories that could become entangled in moving parts.

2.5 Handling and Storage

- Store the unit in a dry, dust-free environment. Protect from freezing temperatures.
- Keep the unit out of reach of children and untrained personnel.
- Do not place heavy objects on the wire feeder or control box.

3. Setup and Operation

3.1 Mounting

Slide the bottom mount upward onto the handheld laser body. The alignment ridge (see Figure 2) interfaces with a corresponding locating feature on IPG LightWeld units, ensuring correct positional alignment while maintaining unrestricted access to the nozzle attachment nut.

Secure the assembly using the four (4) M4 mounting bolts on the top mount. Only minimal torque is required — tighten until snug; do not overtighten.

Figure 2. Bottom and top mount assembly. Note the alignment ridge (left) and free rotation of the nozzle attachment nut (right).

3.2 Cable Connections

Two cables are required for full operation:

- 4-Pin Motor Cable — connects the motor to the control box.
- 2-Pin Trigger Cable — connects to the IPG LightWeld trigger signal ports.

Connect the crimped ends of the 2-Pin Trigger Cable to the ports on the rear of the LightWeld unit that normally control spool wire boxes. Refer to the IPG LightWeld user manual for correct port identification.

3.3 Control Box Operation

When the external trigger is activated, the two trigger wires are shorted together, commanding the motor controller to run in CW (clockwise) drive mode. The motor continues running as long as the trigger is held, then stops when released.

Use the rotary knob to set feed rate. Reference Table 1 below, or use the following conversion formulas:

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Feed Rate (cm/min)  =  Dial Setting × 0.60
Feed Rate (in/min)   =  Dial Setting × 0.24
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Table 1 — Feed Rate Lookup Table

Dial Setting	Feed Rate (cm/min)	Feed Rate (in/min)
5	3	1.2
10	6.1	2.4
15	9.1	3.6
20	12.1	4.8
25	15.1	6
30	18.2	7.1
35	21.2	8.3
40	24.2	9.5
45	27.2	10.7
50	30.2	11.9
55	33.3	13.1
60	36.3	14.3
65	39.3	15.5
70	42.3	16.7
75	45.4	17.9
80	48.4	19
85	51.4	20.2
90	54.4	21.4
95	57.5	22.6
100	60.5	23.8

Table 1. Dial setting to feed rate conversion. [Setting] × 0.60 = cm/min; [Setting] × 0.24 = in/min

The motor controller is factory-configured in F-01 P02 mode for momentary trigger drive. This setting should not require adjustment during normal operation.

The F-12 parameter controls feed acceleration and deceleration ramp rates. Setting F-12 to 001 provides the slowest (smoothest) ramp. Refer to the ZK-SMC02 user manual for full parameter descriptions.

Figure 3. Control box during normal operation — CW indicator illuminated, Setting 60 (14 in/min), F-01 P02 drive mode.

> ℹ️ **Manual Jog Function**
> - Pressing the CW button manually drives the motor forward.
> - Pressing the CCW button drives the motor in reverse.
> - These buttons can be used to position the filler rod without triggering the welder.

3.4 Loading Filler Rod and Adjusting Drive Tension

To load filler rod:

1. Open the drive gears by compressing them against the pinch spring.
2. Insert the filler rod through the guide and between the drive gears.
3. Release the gears. The rod can be manually pushed back and forth to set the desired starting length.

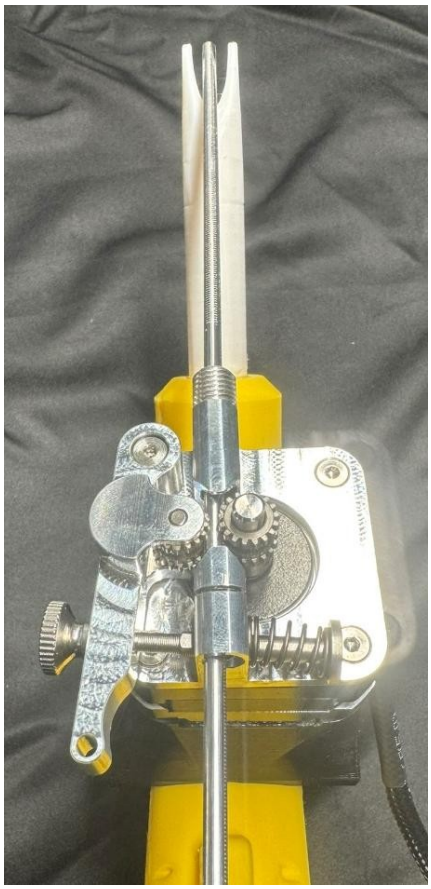

Figure 4. Filler rod installation and tension adjustment knob location.

Drive tension is set using the tension adjustment knob (see Figure 4). Tightening the knob increases pinch pressure on the wire; loosening it decreases pressure. Use the minimum pressure needed to maintain consistent, slip-free drive motion.

Figure 5 illustrates the correct drive gear positioning. The central bore should be visible between the U-groove profiles of the two drive gears when the height is correctly set on the motor shaft. If adjustment is required, loosen the drive gear set screw, reposition the gear, and re-tighten.

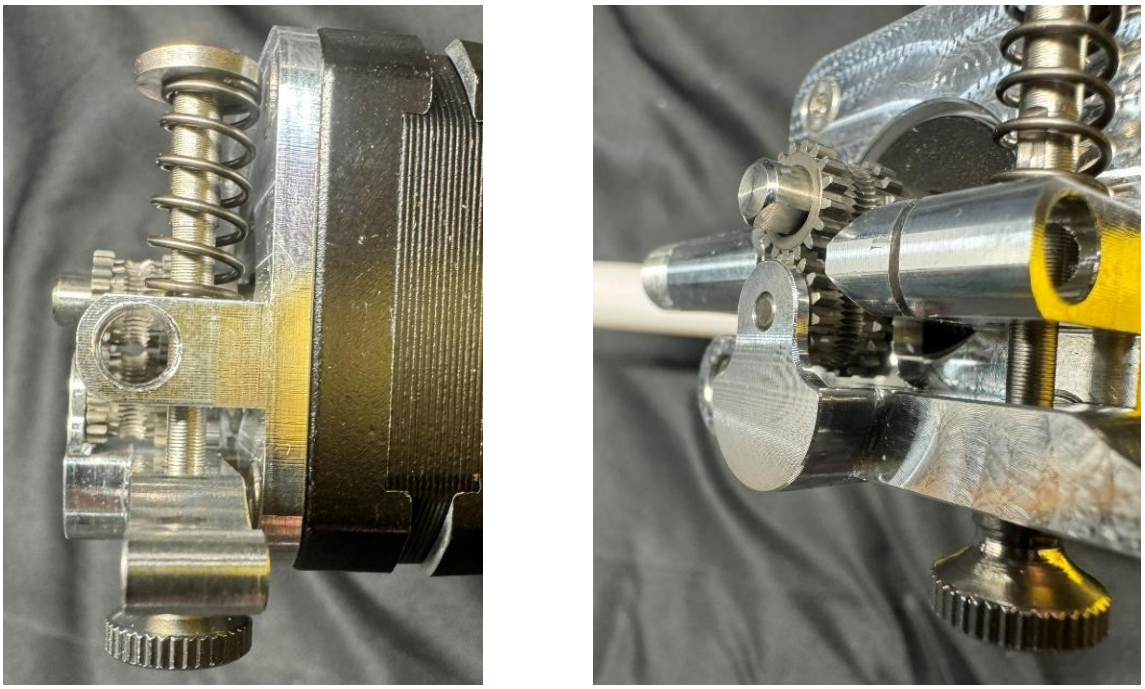

Figure 5. Drive gear positioning — correct gear height shows the central bore between U-grooves (left). Full assembly view (right).

4. Maintenance and Care

The LASER_TUG is designed for minimal maintenance. Follow the guidelines below to ensure reliable long-term operation.

4.1 Routine Cleaning

- Periodically blow out the drive gear assembly with clean, dry compressed air to remove metal filings, weld spatter, and foreign object debris (FOD).
- Inspect the drive gears and wire guide for visible contamination or wear before each use.

4.2 Lubrication

No lubrication is required. Do not apply oil or grease to the drive gears, motor shaft, or wire guide.

4.3 Storage

- Store the unit in its original packaging or a clean, dry case when not in use.
- Disconnect all cables before storage.
- Protect from freezing temperatures and humidity.

5. Troubleshooting

Refer to the table below for common symptoms and corrective actions. If an issue cannot be resolved using these steps, contact Cascade InnoTech support at LaserTug@CascadeInnoTech.com.

Symptom	Likely Cause	Corrective Action
Motor does not turn when trigger is pulled	Loose cable connections or incorrect controller mode	1. Verify all motor drive and trigger cable connections are fully seated. 2. Press the CW button on the controller — if the motor runs, the issue is with the external trigger signal. 3. Double-check IPG LightWeld trigger port connections and short the trigger cable wires together to confirm control box function. 4. Hold the rotary dial to enter setup mode and confirm F-01 P02 is selected. Note: Small accidental dial rotations while holding can inadvertently change settings.
Filler rod feeding but no forward weld pool motion	Nozzle not contacting workpiece, or worn wire groove	Confirm that the selected nozzle pinches the filler rod against the plate or fillet corner. Worn wire grooves in the nozzle can allow the wire to push into the weld pool without generating forward motion. The incoming filler wire must be positioned slightly ahead of the weld puddle and tacked to the workpiece to ensure proper force transfer.
Filler rod sticking to weld plate at end of weld	Wire solidified in the weld pool before withdrawal	At the end of each weld pass, perform a quick upward flick of the handheld laser to withdraw the wire from the puddle before it solidifies.

6. Setting Motor Drive Current

> ⚠ **Important — Factory Current Setting**
>
> • The SMC02 stepper motor controller is capable of supplying up to 4.0A of motor current. At this level, the NEMA 17 drive motor will overheat, potentially softening and damaging the plastic motor mount.
>
> • Before first use, verify the drive current is set to 1.0A using the procedure below.

6.1 Drive Current Adjustment Procedure

The following steps set the Current Regulating Potentiometer on the SMC02 controller board to 1.0A. Refer to Figure 6 (SMC02 back panel) and Figure 7 (potentiometer detail) for visual reference.

4. Remove the front plate from the control box by unscrewing the four (4) corner screws.
5. Locate the Current Regulating Potentiometer on the SMC02 board. Note the two locating dots on either side of the knob's current-position marker.
6. Rotate the potentiometer fully counterclockwise to the minimum (0A) position. Confirm the "+" edge aligns with the dial minimum.
7. Note the angular distance to the 2A position (vertical/12 o'clock).
8. Rotate the potentiometer clockwise approximately halfway to the 2A position. This sets the current limit to approximately 1.0A.
9. Reinstall the front plate and secure with the four corner screws.
10. Apply power to the unit and press the CW button to activate the motor.
11. Confirm adequate motor torque by installing a filler wire and verifying consistent feeding motion.

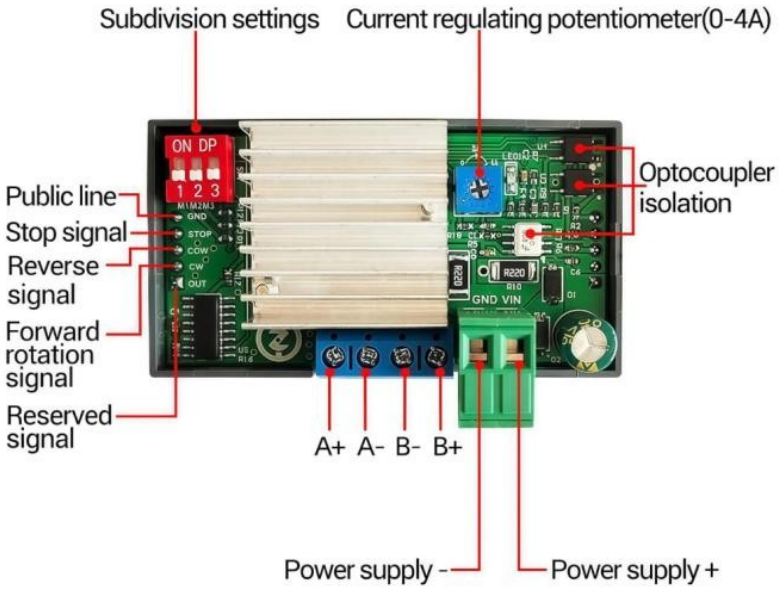

Figure 6. SMC02 stepper motor controller back panel — component identification.

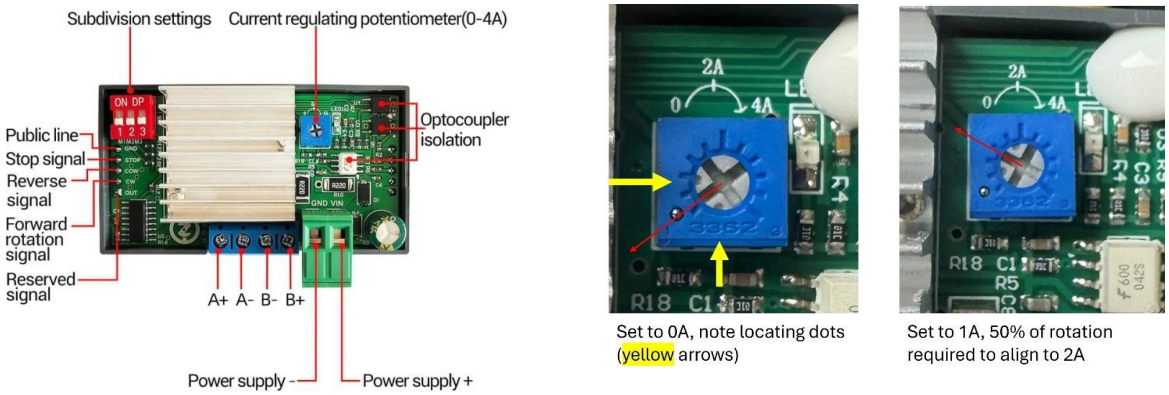

Figure 7. Current regulating potentiometer settings — 0A minimum position (left) and 1.0A target setting at 50% rotation to 2A mark (right).

Note: The left image in Figure 7 shows the potentiometer set to 0A (minimum), with the locating dots visible. The right image shows the correct 1.0A setting at approximately 50% of the rotation required to reach the 2A (vertical) position.

