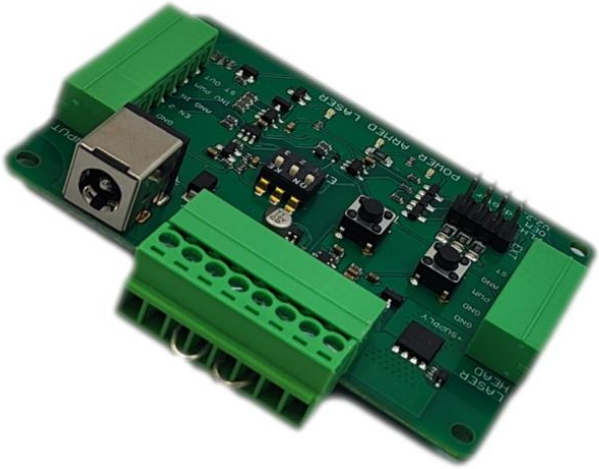
PLH3D-CNC Adapter OEM

User Manual



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General Description

PLH3D-CNC Adapter OEM is a versatile tool suitable for use with Opt Lasers PLH3D-series laser heads: XT8, 30W, 15W, XT-50, XT-10, XF+, or XF. Moreover, it can be seamlessly adapted to other new Opt Lasers laser heads with up to 50 Watts of optical (laser) power.

The primary purpose of PLH3D-CNC Adapter OEM is to convert various control signals generated by CNC machine controllers into a PWM/TTL or Analog control signal format compatible with laser heads. Additionally, it functions as an extra layer of safety for both the user and the laser head.

When installed in accordance with this manual, the Adapter poses no risk to the CNC machine controller.

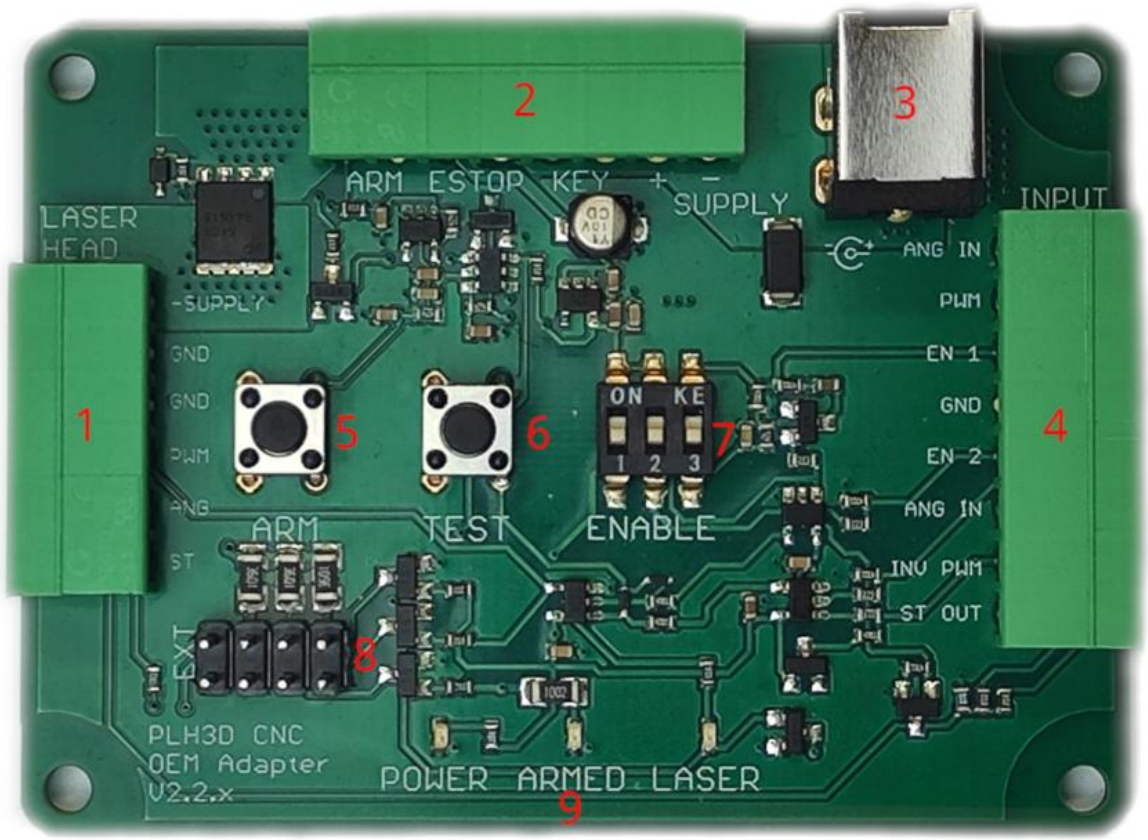
Key Features

- Simple configuration using DIP switches
- Safe start for secure operation
- External key lock and/or stop button support for enhanced safety
- Status LEDs for real-time operational feedback
- Remote arming capability
- Easy integration with most CNC machines
- Identical input/output pinout as CNC Adapter PRO
- Full compatibility with all Opt Lasers heads.

Differences compared to PRO

- Limited enable input states.
- Limited analog control operation
- Test button delivers 100% power while pressed
- External switches required to fully utilize safety features.

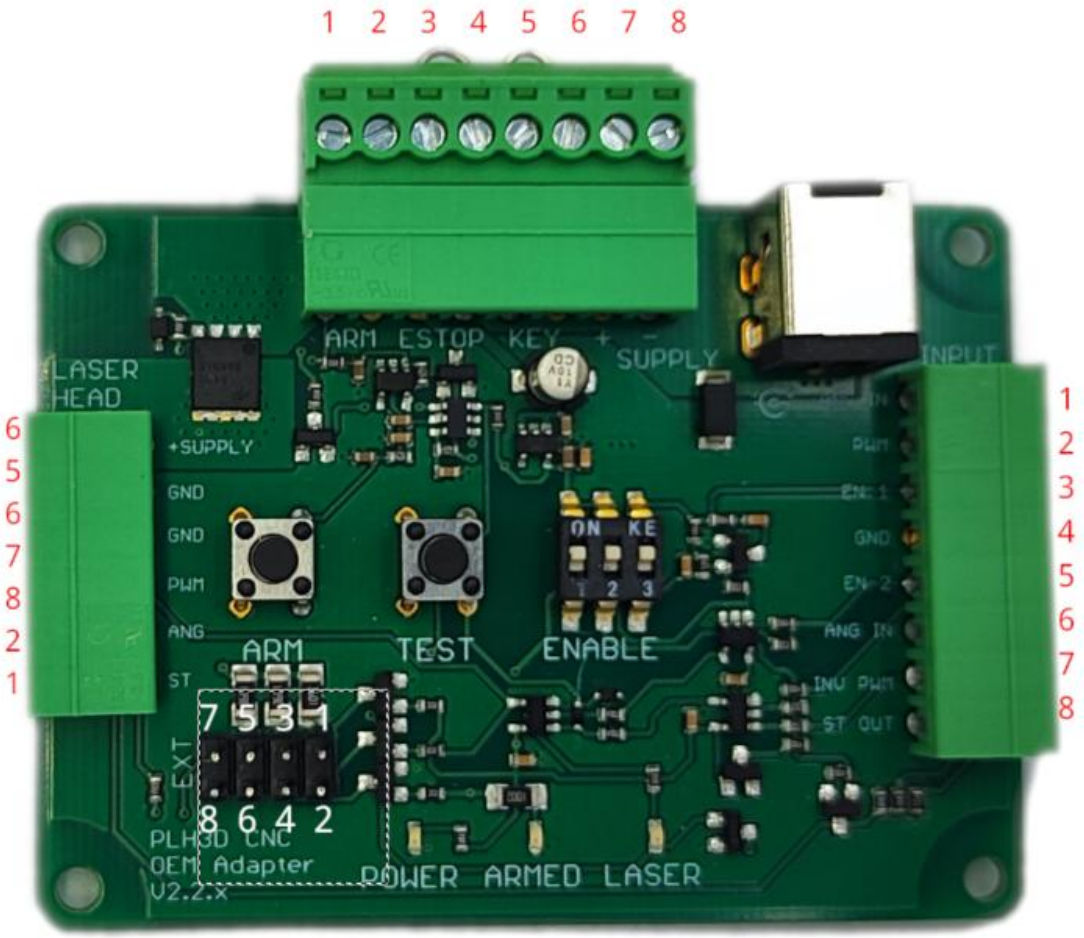
Device Overview



1. **Laser head connector**
    a. Connection for the laser head cable..
2. **External switches connector**
    a. Inputs for arming switch and two external safety switches (e.g., limit switch, key switch, emergency stop)
    b. Unused external safety switches inputs should be closed with jumper wire
    c. Power supply input: 12-24V max 10A.
3. **Supply connector**
    a. Power jack input 12-24V max 9A.
4. **INPUT connector**
    a. Inputs/outputs interface.
5. **ARM Button**
    a. Arms the laser head
6. **TEST Button**
    a. Activates test laser firing while pressed

7. **Enable option selector**
    a. DIP switches to configure enable inputs
8. **Extensions connector**
    a. For external arming switch and status LEDs (mountable in an enclosure
9. **LED status indicators**
    a. POWER: Power supply status.
    b. ARMED: Arming state, external switch activation.
    c. LASER: Presence of laser head control signal.

Pinout



1. **LASER HEAD**
   1.1. **ST:** Status signal from the laser head, passed through to control input
   1.2. **ANG:** Analog modulation output
   1.3. **PWM:** PWM signal output (0–5V TTL normalized)
   1.4. **GND:** Ground signal
   1.5. **GND:** Power supply ground for the laser head
   1.6. **+SUPPLY:** Power supply positive for the laser head
2. **Extension connector (see upper part of the picture)**
   2.1. **ARM +:** Remote arming input (shorting to GND triggers arming/disarming)
   2.2. **ARM -:** Reference ground for ARM+
   2.3. **ESTOP +:** External emergency stop input (+ side)
   2.4. **ESTOP -:** External emergency stop input (- side)
   2.5. **KEY +:** External key switch input (+ side)
   2.6. **KEY -:** External key switch input (- side).

2.7. **Supply +:** Power supply positive equivalent to the DC connector

2.8. **Supply -:** Power supply negative equivalent to the DC connector

3. **SUPPLY :**

3.1. **PIN:** Supply voltage input 12-24V max 9A

3.2. **SLEEVE:** Supply input GND

4. **INPUT**

4.1. **ANG IN:** Analog modulation input

4.2. **PWM:** PWM control function. This input accepts PWM signal with "HIGH" active level. Input works according to TTL standard. Maximum voltage is 24V.

4.3. **EN 1:** A digital input that enables/disables laser controlling. Input works according to TTL standard. Maximum voltage is 24V The functionality of this pin is set by Dip-switch as described bellow

4.4. **GND:** Ground signal

4.5. **EN 2:** A digital input that enables/disables laser controlling. Input works according to TTL standard. Maximum voltage is 24V The functionality of this pin is set by Dip-switch as described bellow

4.6. **ANG IN:** Analog modulation input,

4.7. **INV PWM:** PWM control function. This input accepts PWM signal with "LOW" active level. Input works according to TTL standard

4.8. **ST OUT**: Pass through from status input. Tied to GND if laser head is disarmed.

5. **EXT**

5.1. 10mA LED Pull Up

5.2. ARMED LED open collector

5.3. 10mA LED Pull Up

5.4. POWER LED open collector

5.5. 10mA LED Pull Up

5.6. LASER LED open collector

5.7. External arming switch input

5.8. External arming switch reference

Getting Started

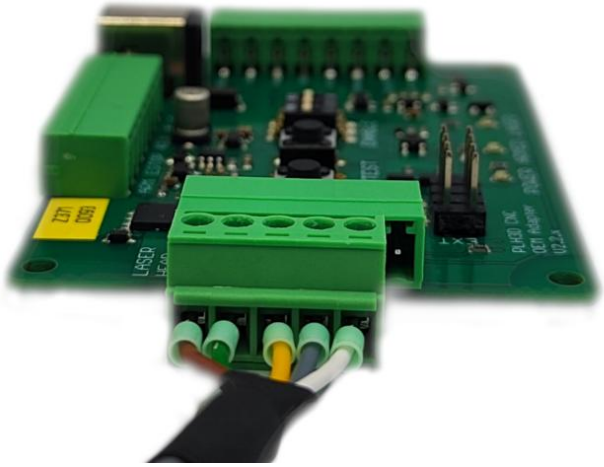
1. Ensure power supply is off.
2. Set desired ENABLE options with dipswitch selector.
3. Connect the laser head to the Adapter.
    a. Secure the laser head mechanically (e.g., on a CNC machine).
    b. If using a Magnetic Docking Station or LaserDock PRO, connect the Adapter to the docking station.
4. Connect the control cable from Adapter to CNC controller.
5. Connect Key switch and/or external switch or leave jumper wires connected.
6. Connect the power supply to the Adapter.
7. Turn on the Key switch if it is connected.
8. **Put on the safety glasses**
9. Arm Adapter with button
10. Test the laser with Test Button
11. You are ready to work

Laser Cable Connection

Opt Lasers PLH3D-Series laser heads utilize either a 5-pin or a 6-pin connector. The section below outlines the proper connection of each type.

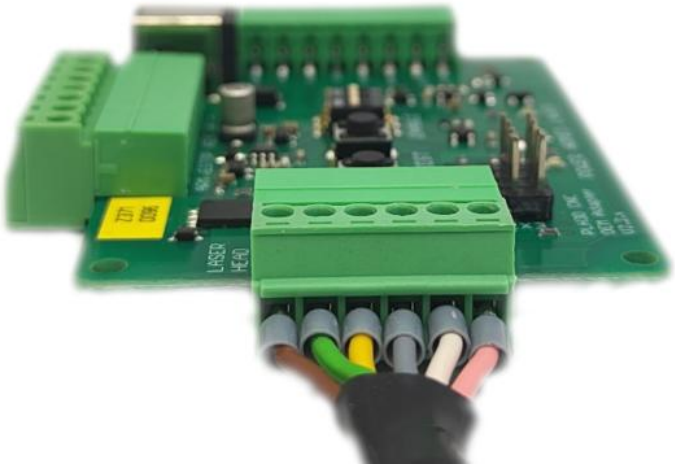
5-pin Connector

When using the Adapter with an laser that is equipped with a 5-pin connector, the connector must be connected in such a way that the ST pin is left unused.



6-pin Connector

When used with a laser cable featuring 6-pin connectors on both ends, either end can be plugged into the Adapter.



Standard Working Modes

After turning on the Power Supply and optional Key Switch, a device initialization is performed

Following the initialization, the CNC Adapter operates in one of its standard working modes, which are described in the further sections.

Disarmed

The CNC Adapter enters this mode after turning on the power supply. **In this mode, the CNC Adapter is in the safe state**. The power supply of the laser head is turned off, and consequently, **no laser action is possible.** The POWER LED is illuminated, while the other LEDs are off.

Disarmed By The User

This is the state after turning on the power supply or after manual disarming.

Disarmed On Error

When an error is recognized during work, the CNC Adapter goes to the DISARMED mode automatically.

The following errors cause automatic disarming:

- **SAFETY SWITCH OPENING**: disconnecting the emergency switch;

Armed

Laser safety glasses must be worn by all present personnel when the laser is armed.

Press the ARM Button briefly to enter the ARMED mode.

In this mode, the power supply of the laser head is activated, allowing the **laser to operate.** Both the POWER LED and the ARMED LED are illuminated. The LASER LED lights up when a signal is present at the laser head output TTL, indicating that the laser is activated.

Press the Button briefly to terminate the ARMED mode and return to the DISARMED mode.

Laser Test

In the ARMED mode Laser test can be performed

Press and hold the TEST Button to fire the laser. Laser will be enabled at full power

LASER IS ENABLED AS LONG AS TEST BUTTON IS PRESSED

Signal inputs

The PLH3D-CNC Adapter OEM accepts both TTL and analog signals as control inputs. These signals should be connected to the INPUT connector of the CNC Adapter.

PWM and INV PWM

PWM and INV PWM inputs allow control of the laser head's power using pulse-width modulation.

Both inputs operate according to the 5V TTL standard. Voltages below 0.8V are interpreted as a "LOW" signal, while voltages above 2V are interpreted as a "HIGH" signal. The maximum acceptable voltage is 24V.

The PWM input uses a "HIGH" signal as its active state, whereas the INV PWM input uses a "LOW" signal as its active state.

PWM inputs are blocked when adapter is disarmed or when the correct enable signal is not present.

When PWM signal is present and passed to laser head LASER LED will light up to indicate signal activity.

ANG IN

Analog inputs of CNC Adapter OEM allows to control laser head power in continuous matter. Output power is proportional to control signal.

ANG IN on pin 1 is recommended to use with 5V control signal. It is passed through 300Ω resistor.

ANG IN on pin 6 is recommended to use with 10V control signal. It is passed through 1kΩ resistor.

Analog inputs are blocked when adapter is disarmed or correct enable signal is not present.

WARNING: Signal passing through analog inputs doesn't lit the LASER LED.

Because of the voltage divider effect caused by the input resistor, the laser head's input impedance, and potential voltage drops in connections, it is recommended to create a power map (calibration) for the connected laser head to ensure precise power control.

Enable inputs configuration

Use Enable DIP Switch to select input behavior.

This option selects one of the following 12 combinations:

Switch position			**Required signal**	
SW 1	**SW 2**	**SW3**	**EN1**	**EN2**
ON	ON	ON	Don’t care	Don’t care
ON	ON	OFF	Don’t care	Don’t care
ON	OFF	ON	Don’t care	HIGH
ON	OFF	OFF	Don’t care	HIGH
OFF	ON	ON	HIGH	Don’t care
OFF	ON	OFF	Toggling	Don’t care
OFF	OFF	ON	HIGH	HIGH
OFF	OFF	OFF	Toggling	HIGH

The required levels are as follows:

- **Don’t care:** can be left open or attached at any voltage in the 0V…+24V range
- **HIGH:** +2V…+24V voltage level;
- **toggling:** changing between LOW and HIGH every 0.25s or faster.

1. Enable 1 configuration
    a. ON Enable input deactivated (ignored)
    b. OFF Enable input activated - required external high signal
2. Enable 2 configuration
    a. ON Enable input deactivated (ignored)
    b. OFF Enable input activated - required external signal
3. Enable 1 mode configuration
    a. ON Enable 1 input active with HIGH signal level
    b. OFF Enable 1 input require TOGGLING (alternating) signal

Remote Arming

This PLH3D-CNC Adapter OEM allows the users to utilize a Remote Arming function.

In this way, the Arming can be performed with an external switch or through the CNC machine controller.

External Switch

The external switch needs to be connected to the "ARM+" and "ARM -" pins in the Extensions connector or pins “External arming switch input” and “External arming switch reference” in the EXT connector.

Short closing switch causes adapter to toggle between Armed ad Disarmed modes

Through CNC machine controller

The "ARM+" pin in the Extensions connector needs to be connected to the proper pin in the CNC machine controller. Refer to the machine’s manufacturer manual for this information.

This option responds to an incoming negative impulse (edge trigger).

Basic Troubleshooting

Problem	Possible reason	Solution
POWER LED is off	Power supply is not connected.	Ensure the power supply is connected to the wall switch and the Adapter.
	There is no main power supply (grid power).	Check the main power supply (grid power).
	The power supply unit is defective.	Replace the power supply unit.
	External switch or external Key switch open	Close the switch or replace it with a jumper wire.
	Jumper wire on external switches open	Verify connection of jumper wires
ARMED LED is off	An external switch has been opened.	Close the switch and rearm the laser.
	Jumper wire on external switches open	Verify connection of jumper wires
LASER LED is off	Lack of control signal	Ensure that Signal cable is correctly connected and wires are correctly secured
	Lack of correct ENABLE signals	Check EANBLE settings on dipswitch or connection of enable signals

Company and Invoice address:
Tomorrow's System Sp. z o.o.
Pułaskiego 125/35
15-337 Białystok, Poland
EU VAT No.: PL5423238556

Shipping address:
Tomorrow's System Sp. z o.o.
Julianowska 14
05-500 Piaseczno, Poland