



Torch height controller user manual

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1 Introduction

1.1 Overview

Plasma CNC cutting machine is one of the most commonly used types of CNC machine. It's used mostly for cutting Steel, aluminium and other conductive materials.

Like any other type of CNC machine, plasma machine has its own specifics. Machine should be properly designed for such type of machining, considering slag, steel dust, high temperatures, moisture, grease etc..

Plasma cutter is a great source of electromagnetic interference. So special care should be taken into account when designing and wiring machine electronics.

Be sure to use shielded cables for motors, limit switches. External power supply for motion controller is very recommended. Plasma cutters themselves sometimes do not satisfy standards of electromagnetic compatibility (EMC), so make sure that your plasma cutter is within EMC regulations.

Heat emitted from plasma could deform workpiece material, usually metal sheet. In such case plasma cutter would not cut at constant height which could result as a faulty workpiece or could damage plasma cutter in the process. This is usually solved with THC device. THC stands for Torch Height Control.

Torch height controller consists from torch height controller and torch height sensor device.

Torch height sensor device measures arc voltage. Bigger the distance between the plasma torch and material higher the voltage and vice versa. So based on the measured voltage value we can maintain constant height of plasma torch above the material.

Torch height sensor device is connected with torch height controller via optic cable. Torch height controller then sends control signals (Up, Down, Arc OK) to motion controller which then dynamically compensates Z axis and thus maintains constant cutting height.

1.2 Features and specifications:

Torch height sensor device:

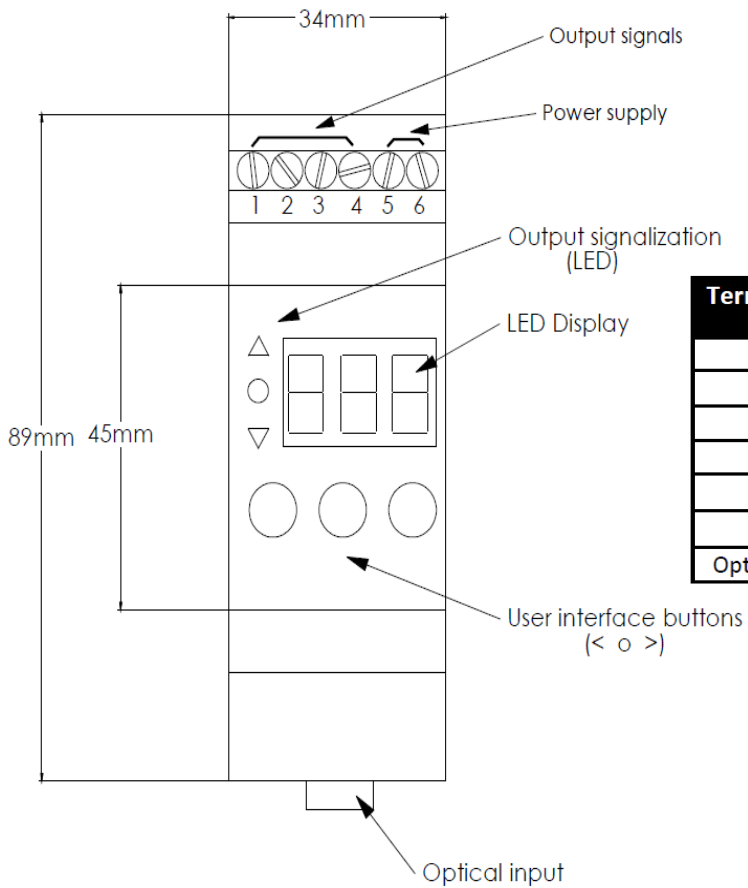
- Plasma arc voltage measurement up to 350 V
- Additional input for divided plasma voltage (1:50) up to 10 V
- Plasma voltage present signalization
- Full optical output isolation; transmitter and receiver connected over an optical fiber cable
- Main AC power supply (110 VAC-230 VAC/50-60 Hz)

Torch height controller:

- Output signals: Arc Ok, Up and Down (normally-open solid-state relay outputs)
- Programmable reference and hysteresis voltage, delay time and anti-dive limit voltage
- Current plasma voltage presentation on LED display
- LED signalization of arc present, up and down signals
- Full optical input isolation; transmitter and receiver connected over an optical cable
- Test mode operation
- Wide power supply voltage range (6 - 36 V)

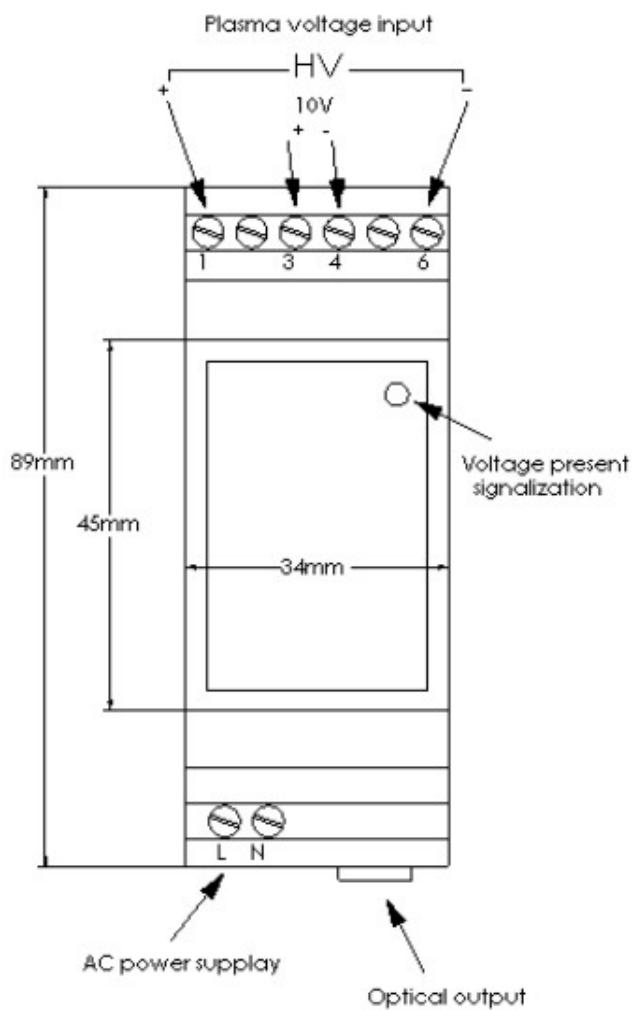
2 Hardware

2.1 Torch height controller terminal description



Terminal pin	Function
1	OUTPUT
2	Solid state relay
3	Max load: 200mA
4	Ron<0.6Ω
5	-
6	+
Optical input	Optical fiber cable -TOSLINK connector (included)

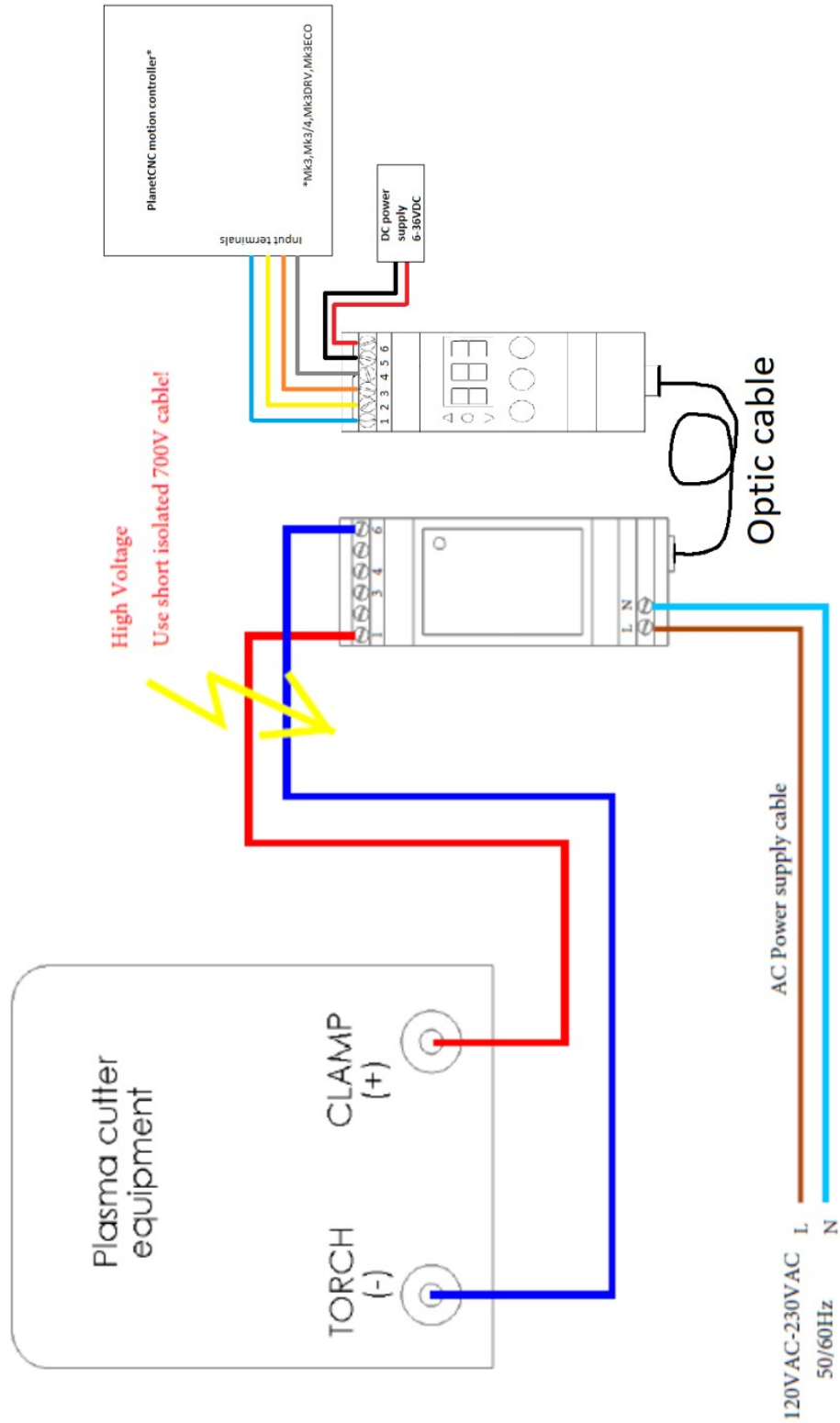
2.2 Torch height sensor terminal description



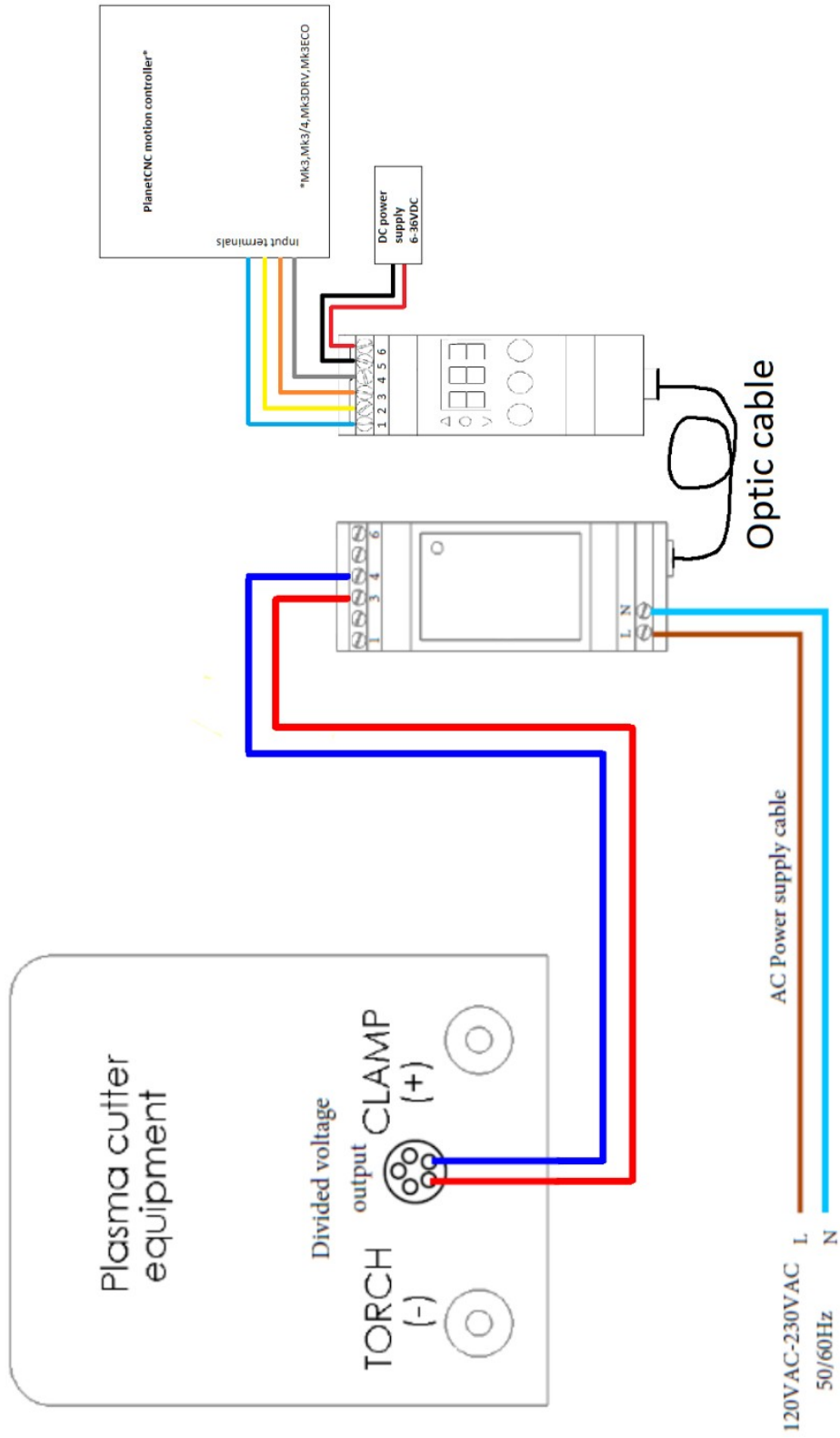
Terminal pin	Function
L	AC Power supply (95 VAC -260 VAC @50 Hz-60 Hz)
N	
1	+ HV input from plasma cutter equipment (350 V max)
3	+ divided voltage from plasma cutter equipment (10 V max)
4	- divided voltage from plasma cutter equipment
6	- HV input from plasma cutter equipment
Optical output	Optical fiber cable -TOSLINK connector (included)

3 Connection diagrams

3.1 High voltage source from plasma cutter

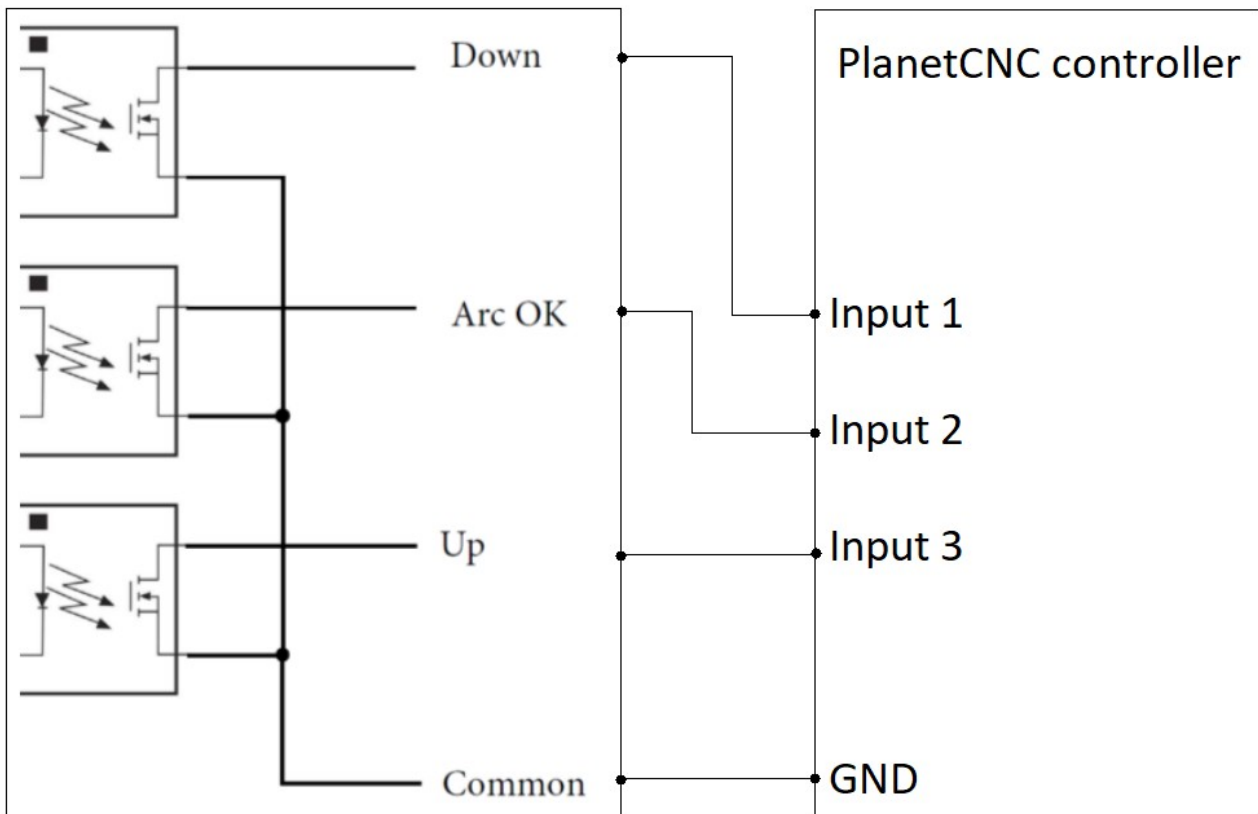


3.1.1.1



3.2 Divided voltage output source from plasma cutter

3.3 Torch height controller connection with PlanetCNC controller inputs



Please note that Down, Up, Arc OK signals can be connected to any input of PlanetCNC controller since inputs function can be configured later in PlanetCNC TNG settings.

4 User Interface

Parameters can be modified during operation and will immediately affect the output signals! Device will automatically save the last settings.

During the plasma cutter's operation, the current arc voltage is shown on the display.

If there are no arc voltage present, display shows - - -.

Reference voltage (Ref) can be set by pushing V (left) or ^ (right) button. (During operation the green (OK) led flashes when reference voltage is setting). User can set Ref from 45 V to 265 V. Factory setting 180 V.

To enter a setup menu press and hold • (middle) button for one sec. The LED display will start flashing then the setup menu will appear.

Select the parameter by pressing • button. Press V / ^ button to modify parameter's value.

Sdt - Set delay time from 0.1 to 9.9 sec. Time between Arc OK signal appears and generation of signals up and down is enabled. Factory setting 0.5 s.

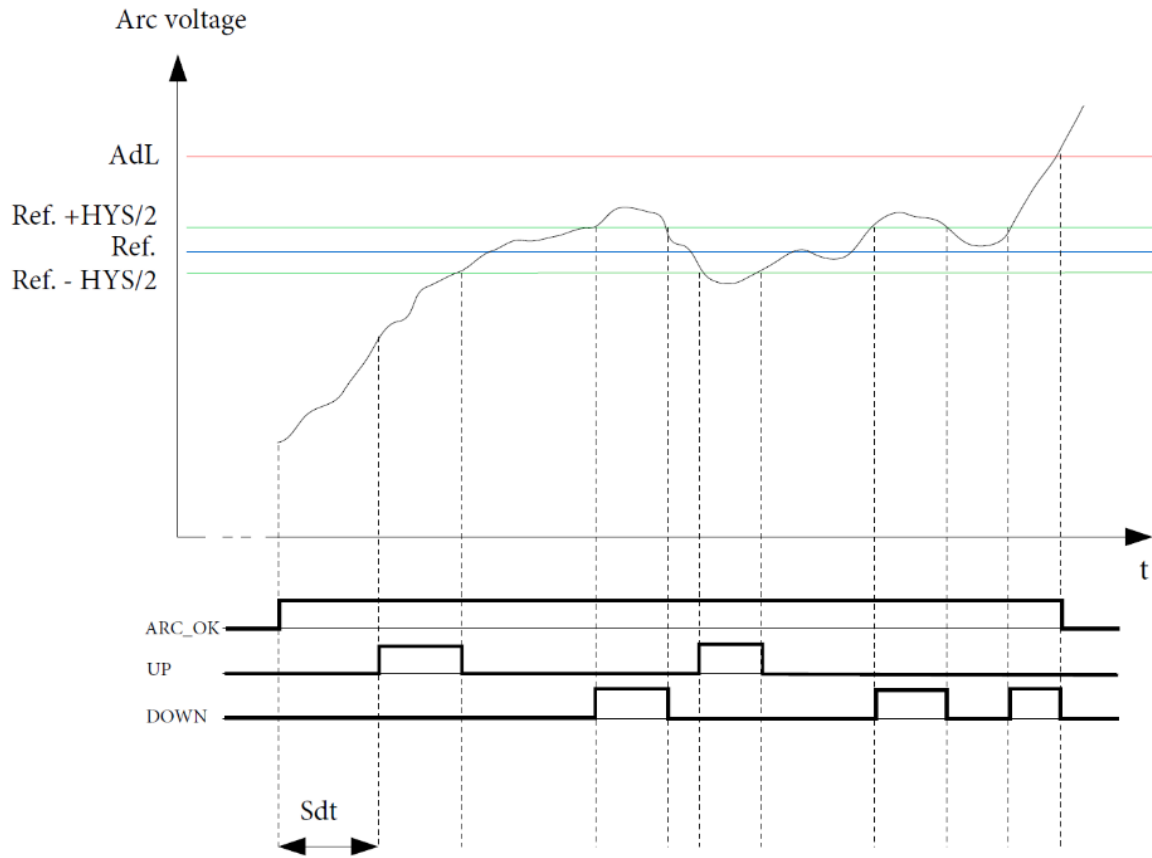
HYS - Hysteresis from 2V to 32 V (2 V step). Voltage frame around reference. If arc voltage is higher than $Ref + HYS/2$ then down signal is generated. If voltage is lower than $Ref - HYS/2$, up signal is generated (see the output signal example below). Factory setting 6 V.

AdL - Anti-dive limit from 50 V to 300 V. Arc voltage that disables THC. If voltage goes higher than Anti-dive limit all output signals go low. The parameter's value must be set higher than reference voltage. Factory setting 220 V.

tSt - Test mode. Only available when no arc voltage present! Pressing V or ^ button generate output signals. The display indicates direction.

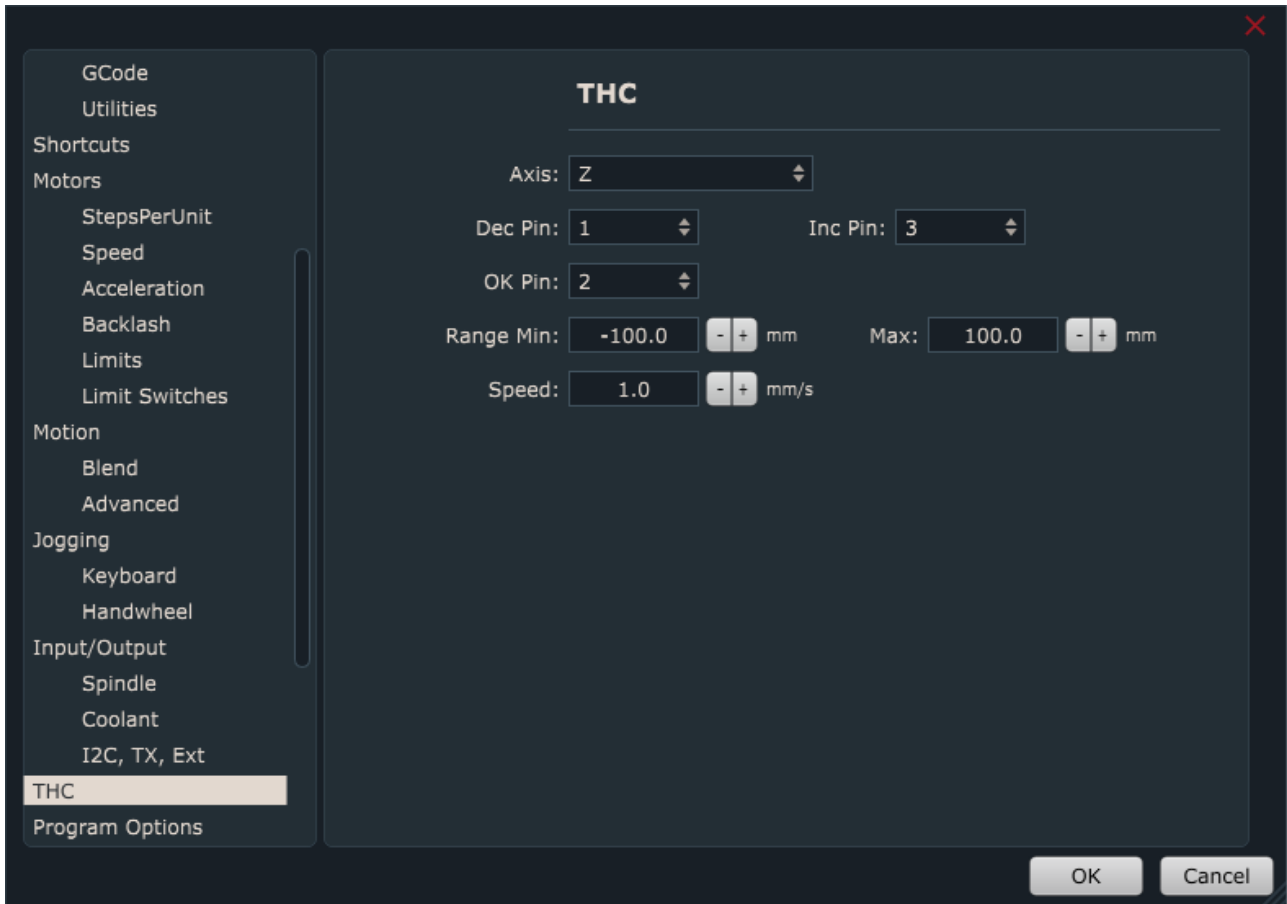
To leave a setup menu, do not press any button for around 2 seconds.

In case of communication failure **E-I** is shown on the display. Please check the optical cable is properly inserted on both sides and that the PlasmaSens sensor device is turned on.



5 Controller input configuration in PlanetCNC TNG software

User can configure controller inputs for THC under File/Settings/THC.



Axis:

User selects machine axis from drop down menu. Selected axis will be height compensated.

Dec Pin:

Dec input pin number, located at INPUT header of controller. Select input pin number from drop down menu.

When this input pin is active, machine will move/compensate in negative direction.

Down signal from torch height controller is connected to this input.

Inc Pin:

Inc input pin number, located at INPUT header of controller. Select input pin number from drop down menu.

When this input pin is active, machine will move/compensate in positive direction.

Up signal from torch height controller is connected to this input.

OK Pin:

OK input pin number, located at INPUT header of controller. Select input pin number from drop down menu.

If set, software waits until this input is active and only then begins with program execution.

Arc OK signal from torch height controller is connected to this input.

Range Min/Max:

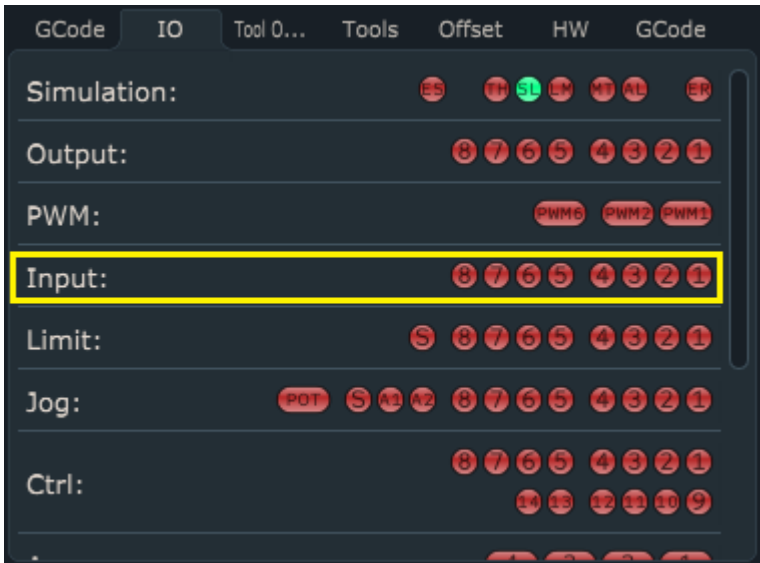
Low and high limit compensation travel.

Speed:

Speed of compensation moves. Units are mm/s or inch/s.

When torch height controller will activate its output, corresponding digital input of controller should activate.

You can observe status of controller inputs via IO tab of PlanetCNC TNG state panel.



6 THC related g-codes

THC compensation can be enabled or disabled, as also additional gcode parameters can be used so that machine behaviour will suit your plasma cutting requirements for better cutting results.

M54 - Enable/Disable THC

Usage: M54 P <Q> <R>

- P = zero for Off, otherwise On
- Q = speed limit
- R = constant speed

If speed limit is set then THC will not move Z axis if machine speed is below set speed.

If constant speed is enabled then THC will not move Z axis if machine is accelerating or decelerating.

Example:

M54 P1 Q1000 R1 – enable THC for constant speeds (no acceleration) above 1000.

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