

CONNECTION AND SETUP MANUAL

TORCH HEIGHT CONTROLLER

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Introduction

The THC1 set is designed for cutting height automatic control of CNC plasma cutting devices. The set consists of two devices: control module THC1-M and voltage divider module THC1-DV1. The both devices are powered by mains voltage ~220 V. It allows to install the divider module in close proximity to plasma source and to preclude the use of any additional power supply sources. The THC1-M measurement module is installed in the system CNC control cabinet. The modules are connected using «twisted pair' cable with 8P8C connectors.

THC1 set has been fully tested with plasma sources manufactured by Hypertherm company, which are well-proven as reliable and high-quality equipment. Most of Hypertherm plasma sources are equipped with special connectors for the THC units connection.

Make sure the following pre-requisites are met for correct operation of the other manufacturers plasma cutters:

1. it allows to connect devices for automatic cutting height control;

2. the cutter electrical output parameters match the THC unit parameters. If the plasma cutter manual does not provide the possibility of the THC unit connection, or plasma cutter parameters do not meet the specified ones, the user is generally responsible for safe connection and system operability.



- THC1-M controller 1 pc.
- THC1-DV1 divider module 1 pc.
- Ethernet cable 1 pc.



Product Features and Specifications

THC1-M module supply voltage	230 VAC
Useful current of THC1-M module	up to 13 mA
THC1-DV1 module supply voltage	230 VAC
Useful current of THC1-DV1 module	up to 3 mA
Measured voltage of plasma cutter arc (HV input)	0-200 V voltage measurement range; 380 V maximal short-duration voltage
Measured voltage of plasma cutter arc (LV input)	0-8 V voltage measurement range; 18 V maximal short-duration voltage
Control interface	Ethernet
Control program	PUMOTIX, MACH3/4 or other control program with UP/DOWN protocol support
Insulation resistance	500 M0hm
Overall dimensions of THC1-M (W x H x D)	120 x 112 x 67 mm
Overall dimensions of THC1-DV1 (W x H x D)	120 x 107 x 67 mm
Weight	2 kg



Attention:

All connections are only to be provided in deenergised state!





Fig. 1. Dimensions of the THC1-DV1 module

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Fig. 2. Dimensions of the THC1-M module



Almost all currently known plasma systems provide an interface for connecting a sensor for measuring current arc voltage. Some of them provide with a low voltage signal with a division ratio.

Such a method of connection to the plasma system is preferable, as the output voltage is safe for human and imposes lower requirements to insulation, which allows arranging a more convenient connection of THC sensor (LV input). If the integrated plasma system voltage divider is unavailable, then THC sensor can be connected directly to special terminals inside plasma system (HV input).

The available THC sensor connection methods shall be described in a plasma system operation manual. The choice of a connection input depends on a plasma system in use. The measurement circuit inside the divider module THC1-DV1 is switched using Control switch (see part 6. Outputs, display and connection purpose).

Operating principle

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The design of the automatic torch height control system using THC1 set differs from other similar systems. In addition to standard «Torch UP" and «Torch Down» signals, the THC1 transmits the effective arc voltage signal over Ethernet. The PLCM series CNC controller received this information, adjusts the torch height and then sends the current adjustment status to the CNC system (PUMOTIX, MACH3, etc.). It allows to eliminate any Z axis autooscillations, as the PLCM knows not only the required adjustment direction, but also the overrange value from which the required Z axis offset at a time can be determined. During «classical» control carried out using «Torch UP» and «Torch Down» signals without PLCM controller some Z axis oscillations may occur. It will affect the cutting quality adversely. In addition to the main measurement function the THC1 set controls torch firing process and transmits the current ARC OK signal status to the PLCM. The torch firing process is monitored by the classical ARC OK signal and the current transformer. The ARC OK input is galvanically isolated from optocoupler. The plasma source switches it by means of a relay. The CT (current transformer) input is used if the plasma source is not equipped with a torch firing process monitoring circuit. A current transformer (100A:5A) inductively coupled with plasma source power supply phase conductor is connected to this input (see the connection diagram).

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The following additional parameters shall be set to the PLCM controller for controlling the plasma cutter height:

• the desired arc voltage (to be selected based on the plasma installation manual). This value can be zero. In this case, upon expiry of «control delay» time after torch firing, arc voltage will be measured and assumed as the desired value. This value will be maintained during cutting.

• if the «ARC OK» signal is used, then after the plasma cutter activation command the PLCM will not move the torch until a confirmation of «ARC OK» actuation is received from the THC1.

This function can be disabled, then movement will begin irrespective of «ARC OK» signal status. In case of arc extincts during movement and ARC OK signal disappears, movement will continue irrespective of the selected mode. The arc extinction is a standard situation. It may occur, for example, if the cutout blank has already dropped out, but the cutting contour was set with some overlapping, and the machine needs to cover some more distance before it extinguishes plasma.

• «control delay» sets the time in seconds for which control will be suspended after the torch activation. During metal piercing arc voltage is almost always much above the standard value, and if control is not blocked this time, the torch will begin moving down trying to normalize voltage. The delay depends on metal thickness and can amount 0 to 5–10 seconds.

• "overvoltage» (previously referred to as «permissible voltage tolerance») sets the overvoltage limit at which control is allowed. If the current voltage exceeds the set voltage by a greater value, then control is suspended until voltage returns to specified range. This is due to the fact that the arc voltage depends on cutting rate also. See the plasma installation manual for recommended voltage values for a particular torch speed. The CNC system decelerates the torch in curves, which results in the arc voltage growth and, consequently, in the torch lowering.

Besides, when the torch passes over the already cut section, the arc voltage rises abruptly to idling voltage. This parameter has been introduced so that the system would not react to such violent voltage fluctuations. Its value is selected experimentally and is usually 5–10% of the desired voltage.



Outputs, display and connection purpose

THC1-DV1 module:

220 VAC - connection to ~220 V AC mains; HV - high voltage input (30...200 V); LV - low voltage input (0...8 V); ARC OK - input of ARC OK signal; ETHERNET - connection to a router or PC network card; DATA CABLE - connection to THC1-M module; POWER - (green) indicator of applied supply voltage;

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ARC OK – (yellow) returns ARC OK input status. It is ON, if ARC OK contacts are closed and it is off, if they are opened;

TORCH FIRE (red) – it returns TORCH FIRE output status. It is ON, if the contacts are closed and it is OFF, if they are opened.

THC1-M module:

220 VAC - connection to ~220 V AC mains;

ETHERNET - connection to a router or PC network card;

DATA CABLE - connection to THC1-DV1 module;

POWER - (green) indicator of applied supply voltage;

ARC OK (green) - the indicator of «ARC OK» signal (it is disabled in CT mode);

TORCH FIRE (green) - the TORCH FIRE output status. It is on, if the contacts are closed and it is off, if they are opened;

ERROR - (red) is lit in case of an error;

LINK – (green) signal of data transmission over Ethernet network;

CONNECT – (green) signal of communication with CNC software;

UP - (yellow) up adjustment signal;

DOWN – (yellow) down adjustment signal.



Fig. 3. Interconnecting cable diagram



Fig. 4. Connection of modules to a plasma source equipped with a voltage divider







Fig. 6. Connection of modules to a plasma source without a voltage divider and Arc ok output



Fig. 7. Connection of modules without a PLCM controller



Fig. 8. Diagram of connection to the plasma system PURM-180 MA

The THC1-DV1 device is installed in close proximity to the plasma source. It minimizes the length of high-voltage wires and allows the module energizing from the line to which the plasma source is connected.

The THC1-M module is installed in a CNC cabinet and connected to PC via a network switch (in case the PLCM controller is used) or directly to the PC network card (if the PLCM is unavailable). The data transmission line (DATA CABLE) has no galvanic coupling between modules which allows avoiding any interference induction by plasma source to the CNC control cabinet. When a PLCM motion controller is absent in the system (PC control movement using LPT port), it is necessary to send signals to vacant inputs, since these inputs are galvanically isolated by means of an optocoupler, it is necessary to use an external power supply source and current-limiting resistors.

For a device to be found, IP address of your PC and THC1 address must be located in the same subnetwork. By default, THC1's address is 192.168.10.12, which means that the PC's address begins with 192.168.10.xxx, and the last number must not coincide with the PLCM's or THC1's address. If the device does not appear in the list, see FAQ section.

It should be noted that for the THC module to be successfully found, the device shall be connected to the same network card as the PLCM controller, i.e. if two network cards are installed in the computer, and the PLCM controller is connected to one of them, and the THC1 device is connected to the other one, then the THC1 module will not operate. Both devices shall only be connected to PC via a network switch. The setup procedure of a network card for the PLCM controller operation is detailed in the movement controller manual. If THC1 is used without a PLCM movement controller, and height is monitored by means of UP and DOWN signals via PC's LPT port, no network switch is necessary. The DHCP switch box is only checked if there is a DHCP server or router in the network. That is to say, if PLCM and THC modules are connected to PV through a router, then IP addresses are assigned to the devices automatically.

In case of connection through an ordinary network switch the controller will receive an unknown IP and will be «lost» in the network – the selection field will remain empty when "Refresh" button is pressed. The way out is using the «Default address» button. The button restores factory network settings to all THC devices in the network. If it is required to assign the THC a different address from the factory setting, then it is necessary to select «Fixed address» position of the switch.

In «IP-address» field enter 192.168.10.XX (xx – address different from the PC's and PLCM controller's address), subnet mask 255.255.255.0. The field «Default gateway» may be left blank. After pressing the button «Set address» the controller will store the changed settings. Then press Refresh button. The module to be connected to the network will be determined in the device selection field.

In PUMOTIX CNC system the IP address changing is done in the THC controller selection menu.



1. The «Link» LED does not blink when Ethernet cable is connected to THC1.

Possible causes: a damaged cable, a malfunctioning network switch, a malfunctioning network card, connection options can not be determined automatically.

Explanation: this LED indicates data exchange between a device and a PC (or DHCP server) via Ethernet.

Solution: check cables, connections, operability of the equipment and its settings using methods similar to troubleshooting in LAN. Set 10 Mbit/Full Duplex connection mode in the network card settings.

2. When Ethernet cable is connected to THC1-M the «Link» LED blinks, but the 192.168.10.12 address device is not pinged.

Possible causes:

1) The controller's IP address is not the default setting.

2) The computer's IP address is not set up correctly.

FAQ

Explanations: by default the THC1-M device has preset address 192.168.10.12, so the computer's IP shall be located in the same subnetwork for successful connection.

Solution:

1) Reset the device settings to default settings (see the instruction below).

2) Set up the PC's address to any address of 192.168.10.xx network manually or using set_ip.exe utility from the <u>SW archive</u> (see the installation instruction).

3. The Ethernet PLCM is pinged, but is not available from the configuration window.

Possible causes: a firewall or some other program blocks traffic between a PLCM controller and a computer.

Explanations: to detect all PLCM devices in LAN, the UDP broadcast queries are used. Some programs in OS Windows, for example, a firewall or anti-virus software, can block such network queries.

Solution: find and disable the program blocking the traffic.

4. How to create your own screen set in Mach3.

If you wish to create your own screen for operation with THC1, the necessary controls are listed below: DRO #1332 – required arc voltage, V DRO #1333 – current (measured) voltage, V DRO #1334 – control delay after torch fire, DRO #1336 - maximum voltage tolerance, V UserLED #1326 – attribute of ARC OK signal use.



Warranty service life is 12 months from the purchase date.

The warranty is only preserved if operation and scheduled maintenance conditions are observed.

1. General provisions

1.1. If the goods is purchased as component parts, Seller shall guarantee operability of each component part individually, but is not responsible for the quality of their joint operation (incorrect selection of component parts. In case of any questions you can consult the company's specialists).

1.2. Seller does not provide any warranty for compatibility of the purchased goods and the goods possessed by Buyer, or purchased by them from any third parties.

1.3. Specifications and configuration of the product can be changed by manufacturer without prior notice due to continuous technical improvement of the products.

2. Conditions for access to warranty service

2.1. The goods is accepted for warranty service in the same configuration in which it was purchased.

3. Warranty service procedure

3.1. The warranty service is carried out by testing (checking for) the declared malfunction of the product.

3.2. The warranty service is carried out if the malfunction is confirmed.

4.The warranty does not cover glass, electric lamps, starters and consumable materials, and: 4.1. any goods damaged due to improper transportation and storage conditions, incorrect connection, off-design operation, or in conditions not stipulated by the manufacturer (including temperature and humidity beyond recommended range), damaged due to effect of exterior circumstances (power supply voltage surges, natural disasters, etc.), and mechanically or thermally damaged goods.



4.2. Goods with traces of effect and (or) ingress of foreign objects, substances (including dust), liquids, insects and those with extraneous texts.

4.3. Goods with traces of unauthorized tampering and (or) repair (tampering signs, primitive soldering, traces of component replacement, etc.).

4.4. The goods having self-diagnostic means indicating improper operation conditions.

4.5. Highly technical Goods in respect of which installation and assembly works were carried out neither by Seller's specialists, nor by organizations recommended by Seller, except cases directly stipulated in the goods documentation.

4.6. The Goods operated in conditions where power supply did not comply with manufacturer's requirements, and if the electrical network and equipment protection devices are unavailable.

4.7. The Goods which was re-sold by the initial buyer to third-party persons.

4.8. The Goods damaged due to use of low-quality or outdated spare parts, consumable materials, accessories and if spare parts, consumable materials and accessories not recommended by the manufacturer were used.

It was manufactured and accepted in accordance with mandatory requirements of the applicable technical documentation and deemed ready for operations.

Batch No.: QCD:

We draw your attention to the fact that there can be some changes in this instruction due to the product consistent technical improvement. You can always download our latest versions at <u>pumotix.com</u>

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