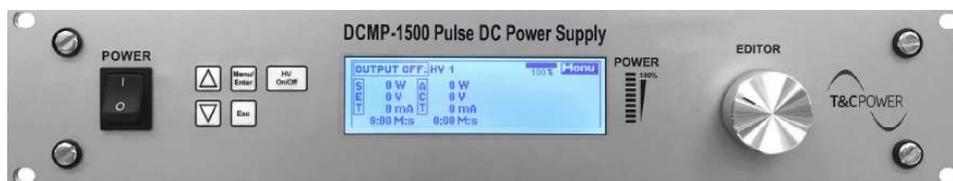


# Magnetron Power Supply DCMP-1500

## User Manual

Start-up, configuration & interfacing of the DCMP-1500 power supply



## Document History

Version	Date	Sign	Comment
1.0	2018-03-18	JL	First version
1.1	2018-05-20	JL	Manual name changed from Users Guide to Instrument Manual. History section added. Revised format and cosmetic changes.
1.2	2018-10-21	JL	Grammar correction and table of contents liftings
1.3	2019-07-21	JL	I/O interface section updated to proper data
1.4	2019-10-09	JL	Interface configuration sections added.
1.5	2019-12-09	JL	I/O interface corrected in proper GND description; Power graph characteristics corrected; US Letter formatting; Data correction to 3A version
2.0	2019-12-12	ZM	Final formatting, editing.

## Table of Contents

<b>1. Introduction.....</b>	<b>5</b>
<b>1.1. Intended Use .....</b>	<b>5</b>
<b>1.2. Liabilities and Warranty.....</b>	<b>5</b>
<b>1.4 Safety.....</b>	<b>5</b>
1.4.1. Personnel Qualifications.....	5
1.4.2. Illustration Of Residual Dangers .....	5
1.4.3. General Safety Instructions .....	6
<b>2. Technical Data .....</b>	<b>7</b>
<b>2.1. General Data.....</b>	<b>7</b>
2.1.1. Mechanical Data .....	7
2.1.2. ambience.....	7
2.1.3. Use and Operating Modes .....	8
2.1.4. Standards.....	8
<b>2.2. Mains Connection .....</b>	<b>8</b>
<b>2.3. Specifications .....</b>	<b>9</b>
<b>2.4 Features: .....</b>	<b>10</b>
<b>2.5. Interfaces.....</b>	<b>10</b>
2.5.1. I/O interface.....	10
2.5.2. UART ( RS232/RS485 ).....	10
2.5.3. ETHERNET/IP.....	10
<b>3. Installation .....</b>	<b>11</b>
<b>3.1. Unpacking .....</b>	<b>11</b>
<b>3.2. Mechanical Installation .....</b>	<b>11</b>
3.2.1. Rack Installation.....	11
<b>3.3. Connections .....</b>	<b>12</b>
3.3.1. Rear Panel .....	12
3.3.2. Mains Connection .....	13
3.3.3. Grounding.....	13
3.3.4. High Voltage Connectors HV1 and HV2 .....	13
3.3.5. Interface Connector <i>Analog remote</i> .....	14
3.3.6 Serial Interface Connector .....	17
3.3.7 Ethernet Interface.....	18
<b>4. Using the Power Supply DCMP-1500.....</b>	<b>19</b>
<b>4.1. Front Panel .....</b>	<b>19</b>
4.1.1. Main Power Switch .....	19
4.1.2. Membrane Keyboard.....	20
4.1.3. High Voltage Indicator .....	20
4.1.4. Alphanumeric LCD display .....	20
4.1.5. Power Bar Identifier .....	20
4.1.6. Rotary Encoder with Press Button.....	21
4.1.7 Main Screen Description.....	21

---

<b>4.2. Menu Operation</b> .....	<b>22</b>
4.2.1. Menu Navigation .....	23
4.2.2. HV Output Selection.....	23
4.2.3. Constant Power Operation .....	24
4.2.4 Power Calculations.....	25
4.2.5. Constant Voltage Operation.....	27
4.2.6. Constant Current Operation.....	27
4.2.7 Timer Operation.....	28
4.2.8 Frequency set in PulseDC operation .....	28
4.2.9 Duty Cycle set in PulseDC operation .....	28
<b>4.3 MENU options navigation and settings</b> .....	<b>29</b>
4.3.1 SETTINGS Menu .....	29
4.3.2 SCREEN Menu.....	31
4.3.3 TARGET Menu.....	32
4.3.4 LIMITS Menu .....	33
4.3.5 RAMPS Menu .....	34
4.3.6 SOFTWARE Menu.....	35
<b>5. Interface configuration</b> .....	<b>36</b>
<b>5.1 Analog Interface Configuration</b> .....	<b>36</b>
<b>5.2 Serial RS232/485 Interface Configuration</b> .....	<b>36</b>
<b>5.3 Ethernet Interface Configuration</b> .....	<b>37</b>
<b>6. Maintenance and Service</b> .....	<b>38</b>
<b>6.1 Maintenance</b> .....	<b>38</b>
6.1.1 Cleaning.....	38
<b>7. Storage and Disposal</b> .....	<b>39</b>
<b>7.1 Packaging</b> .....	<b>39</b>
<b>7.2 Storage</b> .....	<b>39</b>
<b>7.3 Disposal</b> .....	<b>39</b>
<b>8. Troubleshooting</b> .....	<b>40</b>
<b>9. Warranty Conditions</b> .....	<b>41</b>

## 1.1 INTRODUCTION

### 1.1. INTENDED USE

Power Supply DCMP-1500 is a high voltage device which generates a high DC and Pulse DC voltage of negative polarity. DCMP-1500 can be operated in three modes:

*Constant Power, Constant Voltage or Constant Current*

The main field of application is the formation of plasma processes. The concept and design of the power supply allows for safe and reliable integration of complex process control systems. The device is referred to as DCMP-1500 in the remainder of this manual.

### 1.2. LIABILITIES AND WARRANTY

T&C Power Conversion, Inc. company is not liable for damages resulting from improper use of the device and any guarantees expire if the user, or third party:

- ignores information contained in this manual
- utilizes the product in a manner inconsistent with its intended purpose
- makes any modification or alteration of the product
- uses with unauthorized accessories (compatible accessories, types and models, can be found in the product documentation)

T&C Power Conversion, Inc. company reserves the right to make changes without prior notice. Illustrations may vary depending on the version of the device.

## 1.4 SAFETY

### 1.4.1. PERSONNEL QUALIFICATIONS

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end user of the product.

### 1.4.2. ILLUSTRATION OF RESIDUAL DANGERS

Disregarding safety notes can lead to malfunctions or equipment damage.

This Operating Manual illustrates safety notes concerning residual dangers as follows:



Information on preventing any kind of physical injury.



Information on preventing extensive equipment and environmental damage.



Information on correct handling or use.

**Note:**

Indicates particularly important, but not safety-relevant information.

### 1.4.3. GENERAL SAFETY INSTRUCTIONS

For any type of work, adhere to all applicable safety regulations. Please observe all safety notes given in this document and relay the information to all other users of the product. In particular, pay attention to the following safety notes:



*Mains voltage.* Contact with live parts is extremely hazardous when any objects are introduced, or any liquids penetrate into the device.

Keep the device dry.

Make sure that no objects enter through the louvers of the device.

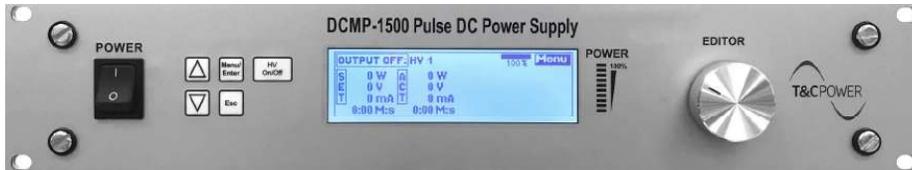
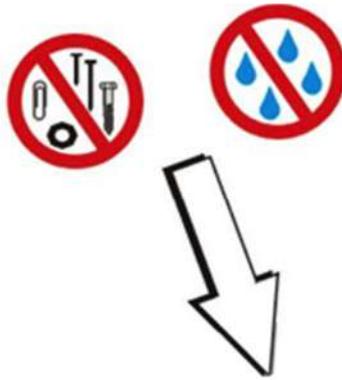


Fig 1.0.1



Improper use can damage the DCMP-1500.  
Use the DCMP-1500 only as intended by the manufacturer.



Improper installation and operation data may damage the DCMP-1500.  
Strictly adhere to the stipulated installation and operation data.

## 2. TECHNICAL DATA

### 2.1. GENERAL DATA

#### 2.1.1. MECHANICAL DATA

Dimensions:	Width: 483 mm Height: 88,1 mm (2 HU) Depth: 395 mm See Fig . 2.1.1
Net Weight:	10.8 kg
Installation:	19" Rack standard or Bench Top unit

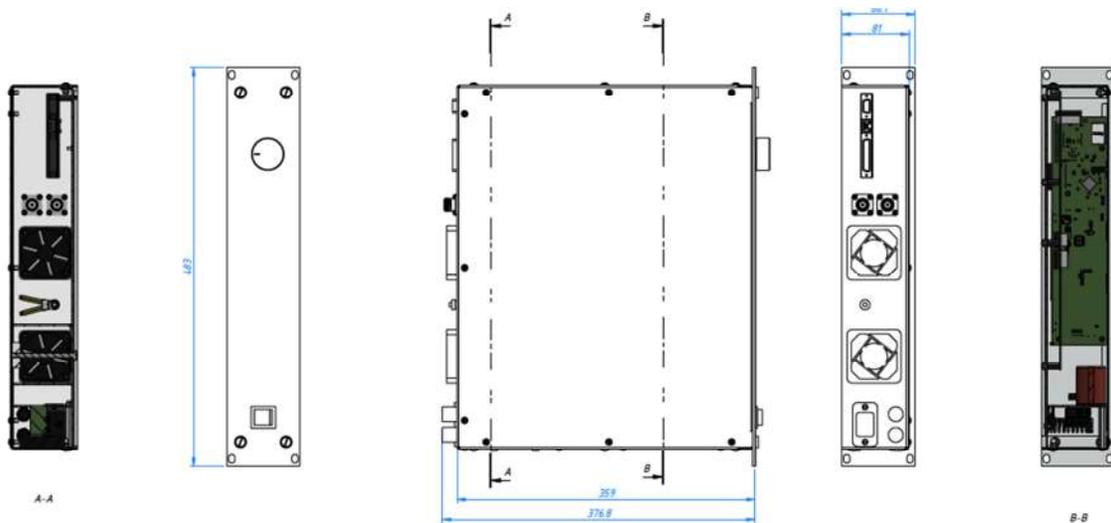


Fig. 2.1.1 Dimensions (mm)

**Note:** Rear panel connectors may differ depending on the version of the device.

#### 2.1.2. AMBIENCE

Temperature Storage:	-10...+60 °C
Operation Temperature:	+5...+40 °C
Relative Humidity:	Max. 80 % (up to 31 °C), decreasing to max. 50 % (above 40 °C)
Use indoor only	
Altitude:	max. 2000 m n.p.m.
The degree of dust standard:	II
Humidity resistance:	IP20

### 2.1.3. USE AND OPERATING MODES

There are three common operation modes:

- manual control, with 5 buttons user interface on the front panel
- software remote control, with RS232/RS485 or Ethernet Interface  
(All **Read** commands are accessible all the time, **Write** commands are accessible only with activation of this function from the user menu – see remote control for use)
- hardware remote control with I/O interface – see *Tab. 3.3.0*  
This mode is active with external signal only. In this mode all of the front buttons are deactivated. To turn the High Voltage off use Main Power Switch on the front panel – *Fig.4.1.0*

### 2.1.4. STANDARDS

Conformity with the Directive relating to electrical equipment designed for use within certain voltage limits 73/23/EWG

Conformity with the Directive relating to electromagnetic compatibility 89/336/EWG Harmonized and international/national standards and specifications:

EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use)

EN 61000-6-2 (Electromagnetic compatibility generic immunity standard)

EN 61000-6-3 (Electromagnetic compatibility generic emission standard)

## 2.2. MAINS CONNECTION

Voltage:	195 to 250 VAC, 1-phase operation
Frequency:	43 - 63 Hz
Current consumption:	Max. 8 A at 230V,
Power consumption:	Max. 1800 W
Overvoltage category II	
Protection class 1	
Connection European appliance connector	IEC 320 C14
Fuse	T16A at 230V

## 2.3. SPECIFICATIONS

<b>Electrical</b>	
<b>Input Supply Voltage</b>	195 to 250 Vac (43 .... 63 Hz), 1-phase operation *
<b>Input Current</b>	Max 8A; Power factor = 0.87
<b>Mode of operation</b>	DC and Unipolar PulseDC
<b>Output Voltage / Current / Power</b>	0 – 1000 VDC negative (ignition voltage 1200V) 0 – 3000 mA (1 mA step) 2 - 1500W max in DC mode; 1050W in PulseDC mode
<b>Regulation mode</b>	Power, Voltage or Current mode
<b>DC Pulse Frequency</b>	10kHz – 300kHz
<b>DC Pulse Duty Cycle</b>	3% – 70%
<b>DC Pulse Max Power</b>	1050 W
<b>Ripple Noise</b>	Switching: 2% p-p (50kHz) Line: 1% p-p (100/120 Hz)
<b>Ramp Up time</b>	Programmable
<b>Communication Interface</b>	RS232 or RS485** and Ethernet 10/100Mb
<b>Methods of control</b>	Local or remote through Communication Interface
<b>Arc Detection</b>	< 2 us Response Time
<b>Dimensions</b>	483 x 395 x 88 mm (W x D x H) - 2U Rack Mounting Standard
<b>Weight</b>	10.8 kg
* alternatively, operation is also possible from two hot wires 3 phase systems, providing the voltage between them does not exceed more than 250 VAC	
<b>I/O control</b>	
<b>Analog Interface</b>	25 D-sub male connector isolated (up to 2000 V RMS, 0...5V Analog, 0/24 VDC Digital)
<b>Serial Communication Options</b>	RS232 or RS485 with ModBUS EDF's protocol **; Ethernet IP, with ModBUS TSP EDF's protocol
** configurable with order only	

## 2.4 FEATURES:

- Operating mode: DC, and PulseDC with variable frequency and duty cycle
- Two high-voltage outputs - the ability to support two independent magnetrons without having to use an external switch
- Fast response arc detection/suppression
- Switched control methods (I, V, P) for maximum performance,
- Transparent interface with OLED display and desk light identification parameters
- Built-in timer
- Stable power operation from just 2W
- High acceptance output impedance - ability to work with magnetrons of different sizes
- Suitable for working with one or two magnetrons
- User-friendly interface with OLED display, keypad and rotary encoder

## 2.5. INTERFACES

### 2.5.1. I/O INTERFACE

Connector:	D-sub 25 female connector Refer to chapter 3.3.5 for details
No of Digital Inputs:	6 – opto-isolated; 24VDC
No of Digital Outputs:	6 – OC type, opto-isolated; 24 VDC
No of Analog Inputs:	3 – voltage input type, opto-isolated ( 0 ... 5VDC)
No of Analog Outputs:	3 – voltage output type, opto-isolated (0 ... 5VDC)
Response time:	100 ms max

### 2.5.2. UART ( RS232/RS485 )

Connector:	D-sub 9 female connector
Transmission mode:	2400, 4800, 9600, 19200, 38400, 57600, 115200 bits/s
Data Length:	8 bit
Parity Control:	none
Stop Bit:	1
Transmission Control:	none

### 2.5.3 ETHERNET/IP

Connector:	RJ45
Transmission mode:	100 MB/s TCP/IP stack, IPv4

**NOTE:** The communication protocol is described in a separate document

## 3. INSTALLATION

### 3.1. UNPACKING

1. Visually inspect the transport packaging for signs of external damage
  2. Unpack the DCMP-1500 and put the packaging material aside
- Note:** Keep the packaging material for later use. The DCMP-1500 must be stored and transported in the original packaging material only.
3. Examine the DCMP-1500 for completeness
  4. Visually inspect the DCMP-1500 for signs of damage



**! DANGER**

*Damaged unit.* Putting a damaged product into operation can be extremely dangerous. Never attempt to put a damaged product into operation. Secure the damaged product from unintended operation. Send a damage report to the haulage company or the insurer.

### 3.2. MECHANICAL INSTALLATION

DCMP-1500 can be used in the following ways: as a bench top device, mounted in a control panel or mounted in a 19" rack. In each case, consider the following important safety information:



**! WARNING**

*The temperature of the environment.* Exceeding the allowable temperature of the device may damage the unit. Make sure that the maximum permissible ambient temperature is not exceeded, and the air can circulate freely through the ventilation slots. Do not expose the device to direct sunlight.

#### 3.2.1. RACK INSTALLATION

The DCMP-1500 is designed for installation into a rack according to DIN 41 494 (19", 2 HU).



**! WARNING**

*Ambient temperature.* Exceeding the maximum permitted ambient temperature may damage the device. Make sure that the maximum permitted ambient temperature is not exceeded and that the air can flow freely through the louvers. Do not expose the device to direct sunlight.



**! DANGER**

*Protection class of the rack.* If the product is installed in a rack, it is likely to lower the protection class of the rack (protection from foreign bodies and water) e.g. according to the EN 60204-1 regulations for switching cabinets. Take appropriate measures to restore the required protection class of the rack.

**NOTE:** To reduce the stress on the front panel, the device must be supported with rack rails.

1. Insert DCMP-1500 guides.
2. Screw the DCMP-1500 using the supplied screws and plastic sleeves.

## 3.3. CONNECTIONS

### 3.3.1. REAR PANEL

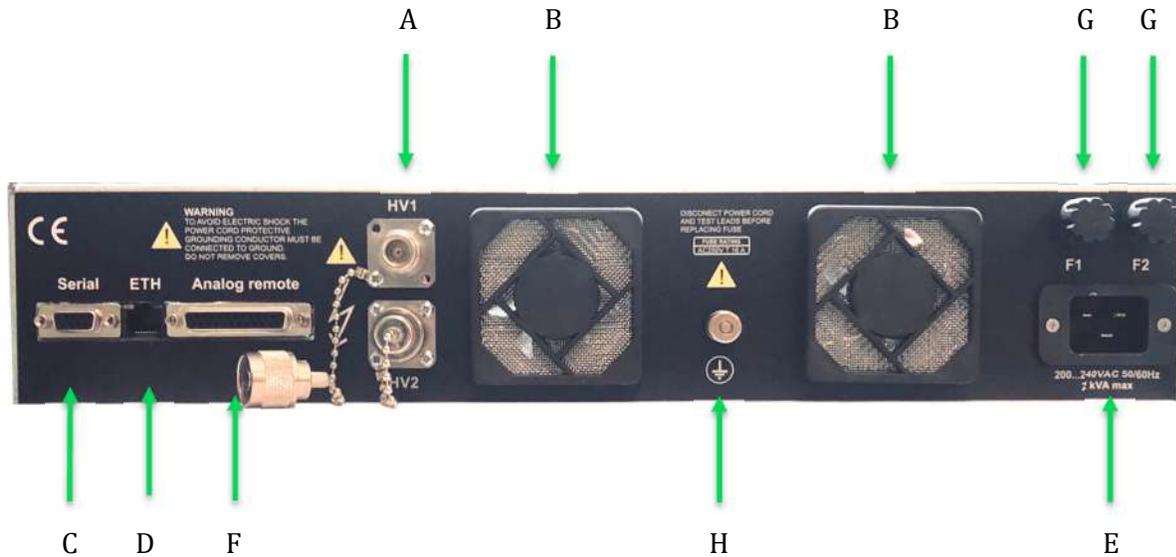


Fig. 3.3.0 Rear panel DCMP-1500

*A – HV1 and HV2 output connectors type N-50/2-0/G1.07*

*B – fans and filters*

*C – RS232 interface D-sub 9 female ( RS485 optionally )*

*D – Ethernet interface RJ45*

*E – main power socket IEC C13*

*F – I/O interface connector D-sub 25 female ( see chapter 3.3.5 for details )*

*G – Fuses*

*H – grounding pin*



*Hardware for internal protective conductor. The internal protective conductor is connected to the casing with a screw. Do not turn or loosen this screw.*

The configuration of the available connections and photographs of cables is described in the following sections.

### 3.3.2. MAINS CONNECTION

The mains connection is designed for a mains cable which contains 16A;250VAC; IEC 60320 connector on the device side. A mains cable is supplied with the device. If the plug is not compatible with your wall socket, you should replace it with a suitable mains cable:

- Three-conductor cable with protective ground
- Conductor cross-section 3x1.5 mm<sup>2</sup> or larger



Fig. 3.3.1 Three-conductor plug with protective ground (example)



**DANGER**

*Mains power.* Improperly grounded devices can be extremely dangerous in the event of a fault. Use three-wire mains or extension cables with protective ground only. Plug the mains cable into wall sockets with protective ground only.

1. Connect the appliance connector of the mains cord with the mains connection of the device
2. Connect the plug of the mains cable to the wall socket

**Note:** If the device is installed in a switching cabinet, the mains power can be supplied via a switchable central power distributor.

### 3.3.3. GROUNDING

Grounding screw (Fig. 3.3.0, the reference H) should be used to connect the DCMP-1500 with the main grounding system in which it operates. It is recommended to use a cable with a minimum section of 2.5 mm<sup>2</sup> (12-14 awg).

If required, connect the vacuum system ground from the earthing screw using the protective conductor.

### 3.3.4. HIGH VOLTAGE CONNECTORS HV1 AND HV2

The power supply is equipped with two HV outputs of N-50/2-0/G1.07 type. Output configuration is set by the software user interface. Please refer to chapter 4.3.0



- 1 - HV1 (- 1000 VDC)
- 2 - HV2 (- 1000 VDC)

Fig. 3.3.2 HV connector , N-50/2-0/G1.07 type



**! DANGER**

*Hazardous voltage.* After entering "Operate" mode (HV LED indicator on the front panel is on), the connector develops voltage levels that may be lethal. The device must be turned off and completely isolated before any work associated with connecting or disconnecting the high voltage cable. When turned off, you must wait at least 15 seconds before attempting to connect / disconnect the HV cable.



**! CAUTION**

It is recommended not to run the device without a connected load. Doing so can damage the power supply.

### 3.3.5. INTERFACE CONNECTOR *ANALOG REMOTE*

Connector interface "Analog remote" (Fig.3.3.0, reference F) used to connect external protection interlock and to control I/O of the power supply. Standard D-sub25 female type connector type.

**Pin outs and functions description:**

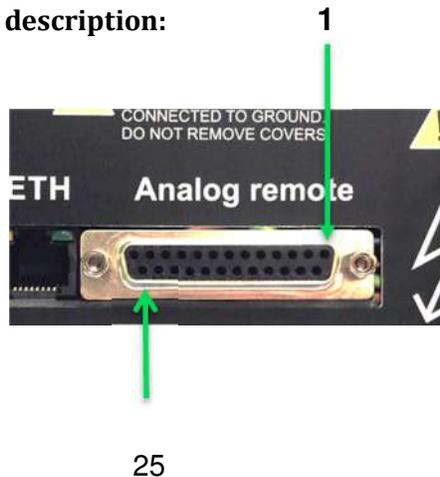
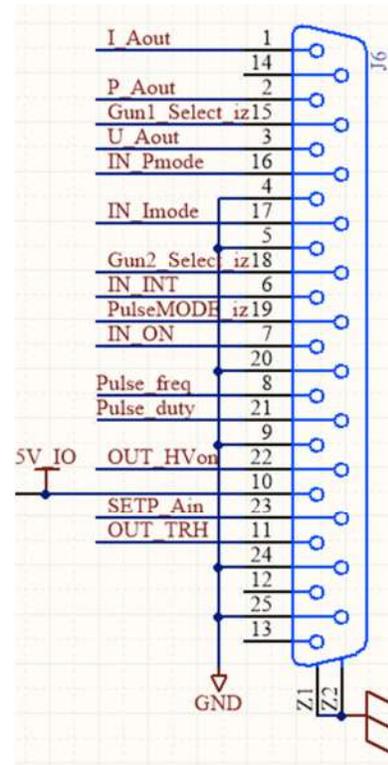


Fig. 3.3.3 I/O Dsub25 pinouts

Pin No	
1	<b>AO</b> Analog Output for output current measurement $I_{OUT}$ ; 0...5V ( 0...2000 mA ); Max load: 50mA
2	<b>AO</b> Analog Output for output power measurement $P_{OUT}$ ; 0...5V ( 0...1500W ); Max load: 50mA
3	<b>AO</b> Analog Output for output voltage measurement $V_{OUT}$ ; 0...5V ( 0...1000 V ); Max load: 50mA
4	Main common <b>GND</b> signal for all of the A/D signals
5	Main common <b>GND</b> signal for all of the A/D signals
6	<b>DI</b> Digital Input signal for external interlock – bridge this signal with pin 5 or 20 or 25 to set the device to active operation. Iin max: 5mA at 5V
7	<b>DI</b> Digital Input – optocoupler type. This pin has to be active to set HV ON. Input Voltage range: 0...5VDC. Input active from 1.8...5VDC; max current consumption 5mA at 5 VDC <b>IMPORTANT:</b> this input change the state on rising slope of the signal only, to prevent automatic activation after powering on. To set this pin active, Analog Control has to be set in the user menu – ref. to chapter 4.3.1
8	<b>AI</b> Analog Input - set frequency in PulseDC mode operation. 0.5V ( 10...120 kHz ), Iin: 20mA max
9	Main common A/D <b>GND</b> signal for all of the Analog/Digital signals
10	<b>5VDC</b> source, max 500 mA. This signal should be applied according to the A/D GND – pin.4,5
11	<b>DO</b> Digital Output - Toggle between +5V & 0V to indicate that target usage is below the threshold
12	<b>Not used</b>
13	<b>Not used</b>
14	<b>Not used</b>
15	<b>DI</b> Digital Input – HV1 (Gun1) input selection; 5V = HV1 active, 0V = HV1 deactivated <b>IMPORTANT:</b> To set this pin active, Analog Control has to be set in the user menu – ref. to chapter 4.3.1
16	<b>DI</b> Digital Input – optocoupler type. This pin has to be active to set device into the Constant Power Mode. Input Voltage range: 0...5VDC. Input active from 1.8...5VDC; max current consumption 5mA at 5 VDC. <b>IMPORTANT:</b> If this input stays in non active mode (0VDC) together with the DI pin no. 17, unit will be switched into the Constant Voltage Mode. To set this pin active, Analog Control has to be set in the user menu – ref. to chapter 4.3.1
17	<b>DI</b> Digital Input – optocoupler type. This pin has to be active to set device into the Constant Current Mode. Input Voltage range: 0...5VDC. Input active from 1.8...5VDC; max



	<p>current consumption 5mA at 5 VDC</p> <p><b>IMPORTANT:</b> If this input stays in non active mode (0VDC) together with the DI pin no. 16, unit will be switched into the Constant Voltage Mode. To set this pin active, Analog Control has to be set in the user menu – ref. to chapter 4.3.1</p>	
18	<p><b>DI</b> Digital Input – HV2 (Gun2) input selection; 5V = HV2 active, 0V = HV2 deactivated</p> <p><b>IMPORTANT:</b> To set this pin active, Analog Control has to be set in the user menu – ref. to chapter 4.3.1</p>	
19	<p><b>DI</b> Digital Input – operating mode selection: 0V = DC operation mode; 5V = PulseDC operation mode</p> <p><b>IMPORTANT:</b> To set this pin active, Analog Control has to be set in the user menu – ref. to chapter 4.3.1</p>	
20	<p>Main common A/D <b>GND</b> signal for all of the A/D signals</p>	
21	<p><b>AI</b> Analogue Input - set duty cycle in PulseDC mode operation. 0..5V ( 1 .. 75% ), Iin: 20mA max</p>	
22	<p><b>DO</b> Digital Output – this output stays in the high state (+5V), when High Voltage is activated</p>	
23	<p><b>AI</b> Analog Input - set output voltage, current or power; up to selected mode at pin 16 and 17. Iin: 20mA max</p>	
24	<p>Main common A/D <b>GND</b> signal for all of the A/D signals</p>	
25	<p>Main common A/D <b>GND</b> signal for all of the A/D signals</p>	

Tab. 3.3.0 “Analog remote” connector description

The minimum required wiring is external interlock mode configuration – see Fig. 3.3.4

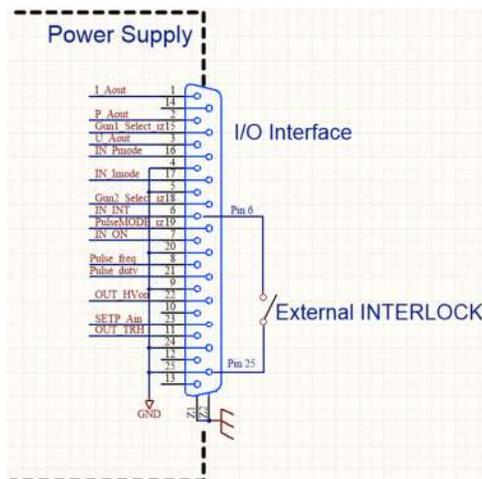


Fig. 3.3.4 Minimum required wiring

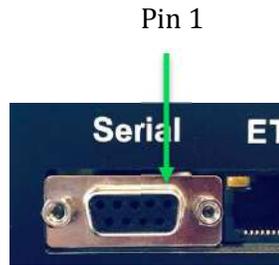


In the case of **incorrect** connection - in accordance with Tab. 3.3.0 and Fig. 3.3.4, there is a danger of damage to the power supply.

### 3.3.6 SERIAL INTERFACE CONNECTOR

DCMP-1500 can be controlled via RS232 or RS485 interface. The transmission protocol is described in separate document – contact supplier for details if needed.

**NOTE:** only one interface is available and has to be configured with order  
 The RS485 interface is Half-Duplex type and requires a terminal resistor – please refer to *Fig.3.3.4* and *Tab.3.3.1* for hardware details.



*Fig. 3.3.4 Serial connector*

Serial Interface	
RS 232	RS485
1. Not Used	1. Not Used
2. RxT	2. B (-)
3. TxT	3. A (+)
4. Not Used	4. Not Used
5. GND	5. GND
6.,7.,8.,9. Not Used	6.,7.,8.,9. Not Used

*Tab. 3.3.1 Serial Interface Connector description*

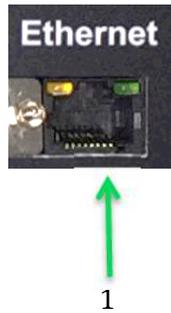
**Note:** If unit is the last one on the line, the 150 ohm terminal resistor is recommended to be connected in the plug in case of wiring between pins A and B

### 3.3.7 ETHERNET INTERFACE

The Ethernet interface allows to communicate with DCMP-1500 based on IEEE 802.2 standard with 100 MB/s speed.

**Note:** to achieve best performance and speed, the LAN cable has to be shielded and Cat-6 or higher. Both crossover/non-crossover types are equally permissible.

Please refer to *Fig. 3.3.5* for hardware connections in T568A standard. Ethernet interface settings are described in chapter 4.3.1



*Fig. 3.3.5 Ethernet RJ45 connector ( T568A standard )*

*1 – Receive +*

*2 – Receive –*

*3 – Transmit +*

*4 – Not Used*

*5 – Not Used*

*6 – Transmit –*

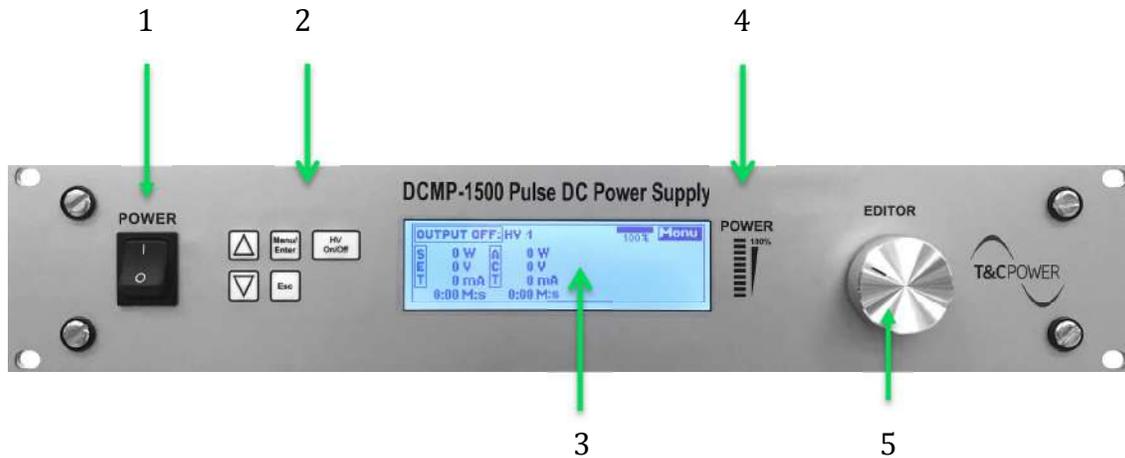
*7 – Not Used*

*8 – Not Used*

## 4. USING THE POWER SUPPLY DCMP-1500

### 4.1. FRONT PANEL

Please refer to *Fig. 4.1.0* for front panel details



*Fig. 4.1.0 Front Panel of DCMP-1500*

- 1 – main power switch – Rocker type
- 2 – membrane press keyboard
- 3 – alphanumeric display LCD
- 4 – power meter bar
- 5 – rotary encoder with press button

#### 4.1.1. MAIN POWER SWITCH

Switching on the power button (position 'I') activates the main power circuit of the device. There is no possibility that high voltages can appear on the output connectors before transition to 'Operate' mode (see Chap. 4.2.1).

Switching off the unit (position 'O' switch) completely cuts the power to the internal circuits - power supply is safe to make rear panel connections.



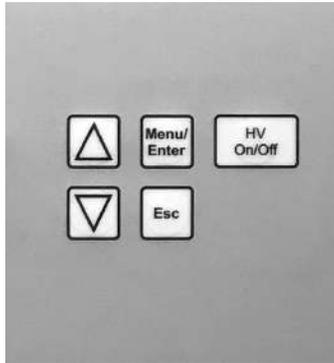
**! DANGER**

*Risk of electric shock.* All connection to the devices may only be carried out with the unit is turned off - the main power switch in 'O' position. Failure to do so may cause electric shock.

### 4.1.2. MEMBRANE KEYBOARD

#### USER INTERFACE

##### KEYBOARD:



Operations on the keys refer to interaction with the LCD display, and switches the power supply into the OPERATE or STAND BY mode

**HV On/Off** – turn the high voltage ON/OFF – switch to OPERATE/ STANDBY mode

**Up, Down** – user interface menu positions change

**ESC** – cancel the operation – move one menu level up

**MENU/ENTER** – this button has two functions: 1) go to the Main menu, 2) confirm current setting

*Fig 4.1.2 Press buttons description*

### 4.1.3. HIGH VOLTAGE INDICATOR

Yellow HV LED color indicates the presence of high voltage on the output of the power supply. If the power supply is in the OPERATE mode then high voltage is ON. If the indicator remains blank, power supply remains in the STAND BY mode – high Voltage OFF.



*High Voltage presence.* An active HV indicator indicates the presence of high voltage output of the power supply and all circuits connected to the HV1 or HV2 outputs. Improper use of the device may cause electric shock.

### 4.1.4. ALPHANUMERIC LCD DISPLAY

Interaction with the user takes place by means of a multiline alphanumeric LCD display with character height of 12.9 mm. The display has adjustable brightness and contrast - see Chap. 4.4.1

### 4.1.5. POWER BAR IDENTIFIER

Maximum output power of the device is 1500W in DC mode, and 1050W in PulseDC mode. This value is proportionally presented by the LED power bar identifier. Three different colours (green, yellow and red) additionally identify the power level.

#### 4.1.6. ROTARY ENCODER WITH PRESS BUTTON

Multi-turn encoder provides a user interface for changing values/options selected with the keyboard.

#### 4.1.7 MAIN SCREEN DESCRIPTION

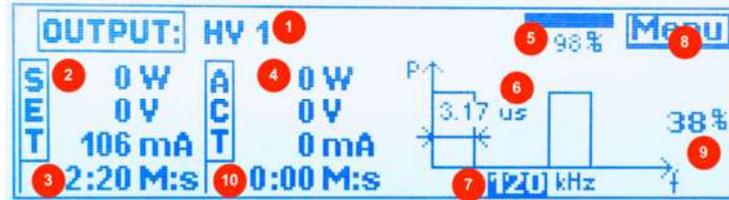


Fig. 4.1.1

No	Description	No	Description
1	Actual output selection	6	PulseDC indicator
2	Set point	7	PulseDC frequency
3	Deposition time indication	8	Main Menu tab
4	Actual measurements	9	PulseDC duty cycle
5	TG indicator	10	Deposition remaining time

The currently selected option is highlighted by selection mask. Turn rotary encoder or use arrow buttons ▲ or ▼ to select required tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings

## 4.2. MENU OPERATION

Selecting and setting the operation parameters can be done in two ways: by selecting **ENTER / MENU** button and navigate between the options of a menu using the arrow keys **▲** or **▼**. To enter the selected sub-menu, again press **ENTER / MENU** button. The current operation can be canceled at any time by pressing the **ESC** key. Pressing this this key also goes back to the previous menu.

If there is no reaction/further keypress for 30 s, the display returns to the main menu. The same interaction can be done using rotary encoder with integrated press button option. Menu structure is shown in Fig.4.2.0

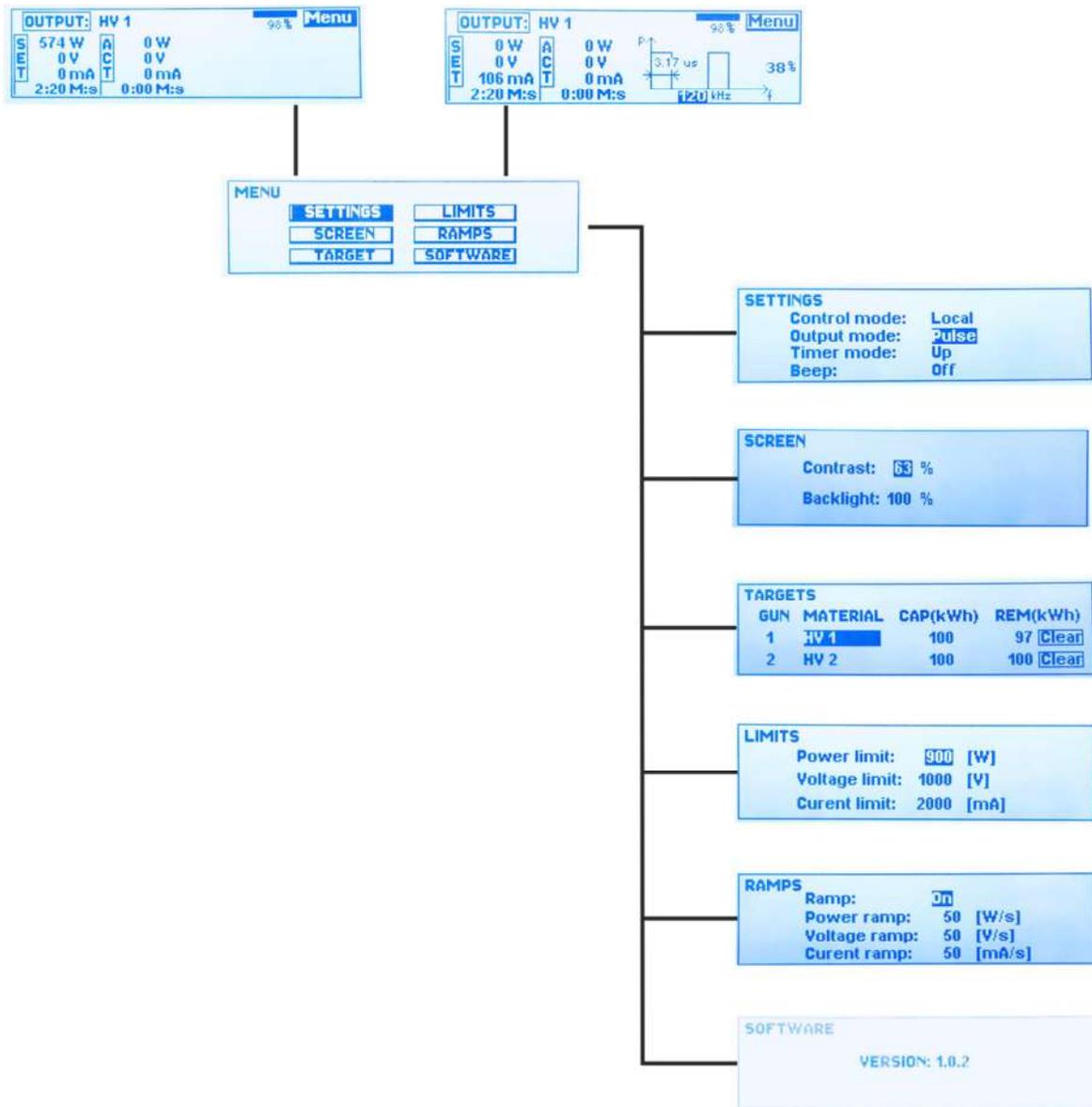


Fig.4.2.0

### 4.2.1. MENU NAVIGATION

Navigation on the pages can be done in two ways:

- using the buttons on the front panel
- or rotary encoder knob

Use narrow buttons or rotary encoder to move between the options. See *Fig 4.2.1* as example of “Menu” selection, and *Fig 4.2.2* as example of frequency sets – field is displayed in inverted background color. To edit selected option, just press the *Enter* button or press *Rotary Encoder*. Inverted background will start to blink; continue *Encoder* rotation to set the value. When its finished, just press *Enter* or *Encoder* once more time – inverted field will stop to blink.

Main menu interface can look different – up to the selecting mode operation: DC mode or PulseDC mode – refer to chapter 4.3.1 for proper selection. Main menu in DC mode operation is shown in *Fig. 4.2.1* and PulseDC mode in *Fig.4.2.2*



Fig.4.2.1

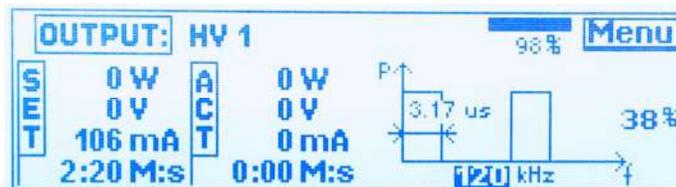


Fig.4.2.2

### 4.2.2. HV OUTPUT SELECTION

DCMP-1500 can run with 2 outputs. They are not working parallel – only one can be selected at a time. Current output selections is displayed on the main menu – *Fig4.2.3*

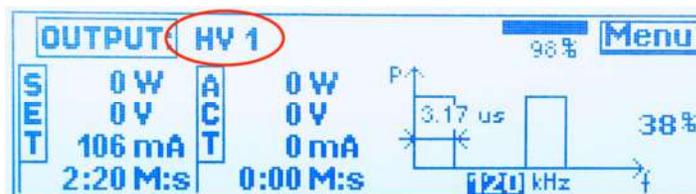


Fig. 4.2.3

**NOTE:** It is possible to assign any name to the output if preferred – according to used target for example. For customized naming please refer to the chapter 4.3.3

To change the output selection, turn rotary encoder knob or use arrow buttons ▲ or ▼ to select *OUTPUT* field ( *Fig.4.2.2* ) and then press the encoder or **ENTER** button to edit mode – this will turn selected field into the blinking ( about 1/s ). Now HV output selection is possible – use rotary encoder or arrow buttons to change the output and

confirm selection by ENTER button or rotary encoder pressing; system will return to the option selection – no blinking tabs.

### 4.2.3. CONSTANT POWER OPERATION

To operate power supply with Constant Power Operation, turn rotary encoder knob or use arrow buttons ▲ or ▼ to select power in *SET* field ( Fig.4.2.4 ) and then press the encoder or **ENTER** button to edit mode – this will turn selected field into the blinking ( about 1/s ). Now output power set is possible – use rotary encoder or arrow buttons to change it.

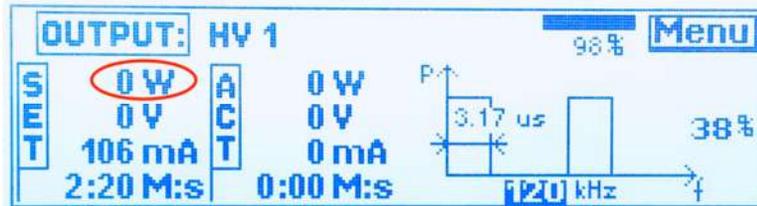


Fig. 4.2.4

#### NOTE:

- ⇒ Type of operation (Constant Power, Voltage or Current) can be selected only when high voltage HV is not active. When HV stays on, then value of selected mode can be set only.
- ⇒ Maximum adjustable output power value is limited by “Limit Settings” – refer to chapter 4.3.4 for details.
- ⇒ Input data for Constant Power, Voltage or Current operation are set in the same way for both of mode of operation: DC or PulseDC

## 4.2.4 POWER CALCULATIONS

Output power of DCMP-1500 is up to the mode operation: DC or PulseDC. It is really important to understand how it works.

For DC mode operation it is really easy, and output power is calculated according to the following formula:

$$P_{out} = U_{out} \times I_{out}$$

where:

$P_{out}$  – nominal output power [W]

$U_{out}$  – nominal output voltage [V]

$I_{out}$  – nominal output current [A]

Maximum output voltage for DC operation is 1000 V (1200V during ignition), and max output current is 3A, however max output power is 1500W, and DCMP-1500 is operating according to the following characteristic in DCmode:

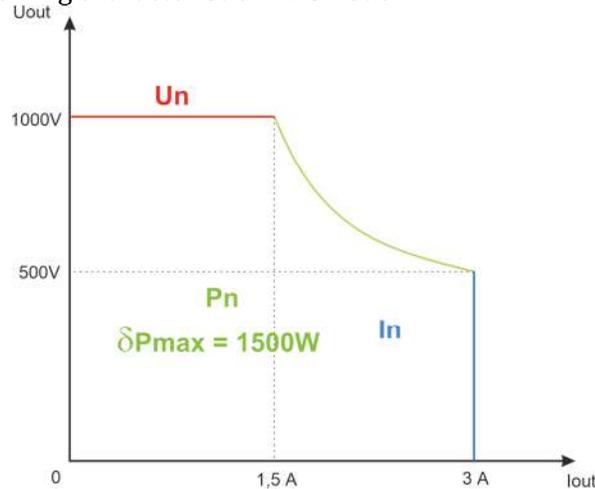


Fig.4.2.5 DCMP-1500 output characteristic in DC mode

For PulseDC operation mode it has to be considered, that output power is defined as a multiplication of a root mean square values of current and voltage. The RMS values are calculated for each factor separately. The output power can be estimated according to the formula:

$$P_{OUT} = \sqrt{\frac{1}{T} \int_0^T [P(t)^2] dt}$$

where:

$P_{out}$  – rms output power [W]

$P(t)$  – power per time [V]

$T$  – period [s]

Power is the rate, per unit time, at which energy is transferred. For better understanding how the power is calculated see the picture below.

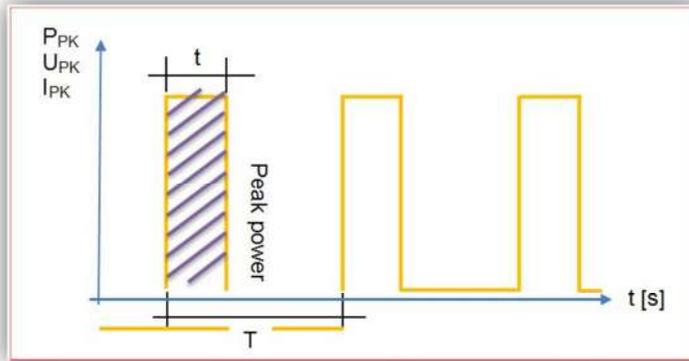


Fig.4.2.6 Output signal of the DCMP-1500 in PulseDC mode

where:

$P_{PK}$ ,  $U_{PK}$ ,  $I_{PK}$  – peak value of power, voltage and current, respectively

$t$  – pulse width,

$T$  – pulse repetition interval.

In the table below are presented relations between peak/average/rms power.

Peak Power	Average Power	RMS Power
$P_{PK} = U_{PK} I_{PK}$	$P_{AV} = P_{PK} \frac{t}{T}$	$P_{RMS} = P_{PK} \sqrt{\frac{t}{T}}$

Since the output signal of current and voltage of DCMP-1500 in PulseDC mode are like square waves, (waves with distorted, irregular patterns—spikes, pulse trains, squares, triangles, sawtooth and any other ragged or angular waves) the output power is calculated as an RMS value of it. Thus, RMS determine power which is the true electrical power delivered to the load.

During the operation in PulseDC mode, the parameters displayed on the LDC are:

**Power:** displayed power is calculated with the RMS power formula as described above

**Voltage:** displayed voltage is a peak pulse voltage

**Current:** displayed current is an RMS value of it

For proper calculation power from displayed values of voltage and current, some recalculation should be done. Since the current is displayed as an RMS value and voltage as a peak value, the voltage should be also calculated as an RMS value of it.

### 4.2.5. CONSTANT VOLTAGE OPERATION

To operate power supply with Constant Voltage Operation, turn rotary encoder knob or use arrow buttons ▲ or ▼ to select voltage in *SET* field ( Fig.4.2.7 ) and then press the encoder or **ENTER** button to edit mode – this will turn selected field into the blinking ( about 1/s ). Now output voltage set is possible – use rotary encoder or arrow buttons to change it.

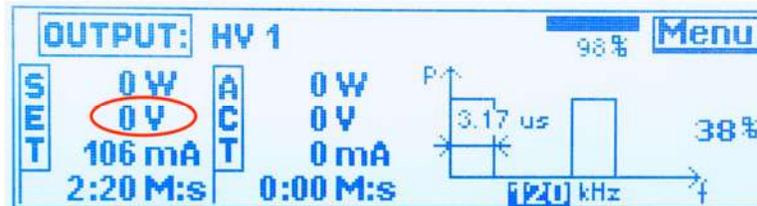


Fig. 4.2.7

**NOTE:**

- ⇒ High Voltage HV cannot be active to change type of operation (Constant Power, Voltage or Current ). Only value of selected mode can be changed while HV is on.
- ⇒ Maximum adjustable output voltage value is limited by “Limit Settings” – refer to chapter 4.3.4 for details.
- ⇒ Input data for Constant Power, Voltage or Current operation are set in the same way for both of mode of operation: DC or PulseDC

### 4.2.6. CONSTANT CURRENT OPERATION

To operate power supply with Constant Current Operation, turn rotary encoder knob or use arrow buttons ▲ or ▼ to select output current in *SET* field (Fig.4.2.8) and then press the encoder or **ENTER** button to edit mode – this will turn selected field into the blinking (about 1/s). Now output current set is possible – use rotary encoder or arrow buttons to change it.

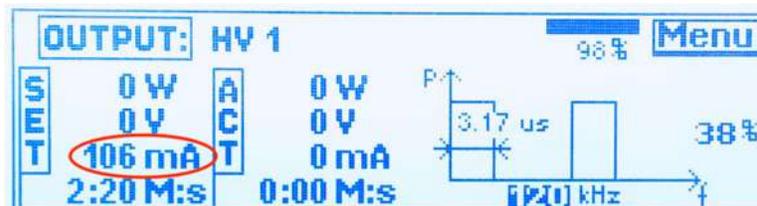


Fig. 4.2.8

**NOTE:**

- ⇒ Type of operation (Constant Power, Voltage or Current) can be selected only when high voltage HV is not active. When HV stays on, then value of selected mode can be set only.
- ⇒ Maximum adjustable current value is limited by “Limit Settings” – refer to chapter 4.3.4 for details.
- ⇒ Input data for Constant Power, Voltage or Current operation are set in the same way for both of mode of operation: DC or PulseDC

### 4.2.7 TIMER OPERATION

DCMP-1500 can run with no limited operation time or according to the required timer set.

Turn rotary encoder or use arrow buttons ▲ or ▼ to select timer TAB; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings – Fig. 4.2.9



Fig. 4.2.9

To set the unit into no timer operation ( Timer Off ) set all timer values to 0 (0:00:M:s). If timer is set to 0, then HV activation will activate HV output active as long as HV button is pressed again.

Any other sets will automatically set the unit into the time counter operation – count down to 0:00:M:s. Timer will start counting as only high voltage operation is started (HV On) and will switch the high voltage off when timer will reach 0 (0:00:M:ss).

### 4.2.8 FREQUENCY SET IN PULSED C OPERATION

Frequency range of operation can be set direct from the main screen menu – there are no needs to go into the advanced settings.

Turn rotary encoder or use arrow buttons ▲ or ▼ to select frequency TAB; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings – Fig. 4.2.10

**NOTE:** Frequency and duty cycle chart is displayed only when PulseDC mode is selected – ref. to chapter 4.3.1

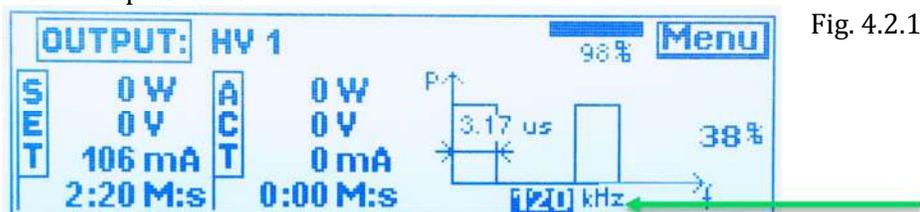


Fig. 4.2.1

### 4.2.9 DUTY CYCLE SET IN PULSED C OPERATION

Duty cycle of the pulse in PulseDC operation can be adjusted from 3 – 70%.

Select duty cycle field, and press **ENTER** button or rotary knob for pulse duty cycle set – Fig. 4.2.11

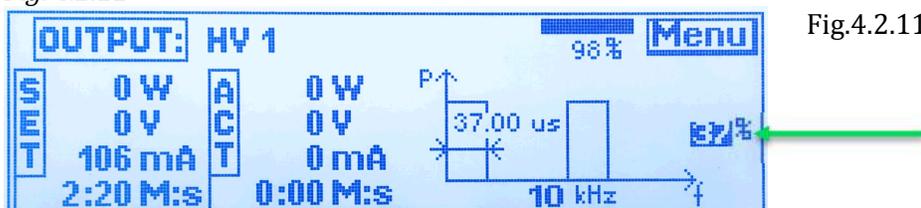


Fig. 4.2.11

Pulse duration is directly depended from the frequency, and automatically changing when frequency change as well. Pulse with is given in the time period and displayed at the graph – Fig.4.2.12.

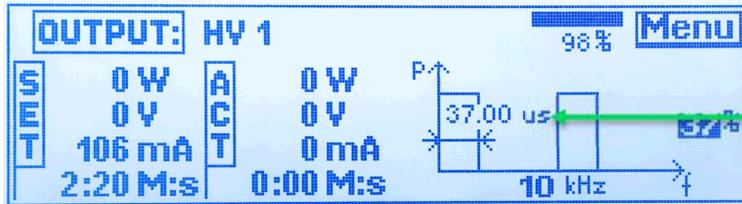


Fig. 4.2.12

**NOTE:** Frequency and duty cycle chart is displayed only when PulseDC mode is selected – ref. to chapter 4.3.1

### 4.3 MENU OPTIONS NAVIGATION AND SETTINGS

All of the advanced options of operation can be set in the MENU folder. Select *Menu* tab (Fig. 4.1.1) on the main page interface and press *Enter* button or *Knob* to switch to the sub menu operations. *Menu* window will pop up than – Fig.4.3.0



Fig. 4.3.0

#### 4.3.1 SETTINGS MENU

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Settings* tab; press **Enter** button rotary knob to edit – Fig 4.3.1



Fig.4.3.1

the following window will pop-up:

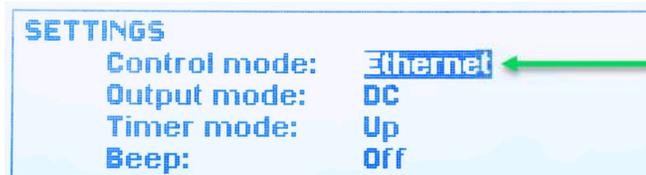


Fig.4.3.2

The following options are possible to set then:

1. **Control mode:** Local, Analog, Serial, or EthernetIP – Fig.4.3.2

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Control Mode* TAB; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

You can then set the following options:

- *Local*: DCMP-1500 is controlled by active user interfacing using front panel buttons and rotary encoder are active and are set for device interfacing,
- *Analog*: DCMP-1500 can be controlled via analog interface – see chapter 3.3.5 for details,
- *Serial*: DCMP-1500 is controlled by serial interface – see chapter 3.3.6 and 5.2 for hardware details and separate “*DCMP-1500 Serial Protocol*”
- *Ethernet*: DCMP-1500 is controlled via Ethernet LAN interface using serial protocol - see chapter 3.3.7 and 5.3 for hardware details and separate “*DCMP-1500 Serial Protocol*”

**NOTE:** You can only set parameters from one mode at a time, although parameters can always be monitored from all existing interfaces (known as passive mode.)

**Also,** Some options might not be available based on the firmware version, please contact supplier for details.

## 2. **Output Mode:** DC or PULSE – Fig.4.3.3



Fig.4.3.3

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Output Mode* TAB; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

The following mode of operation are possible to set:

- *DC* mode operation: DCMP-1500 will operate with DC voltage, current or power operation; see chapter 4.3.3 for details,
- *Pulse*: DCMP-1500 will operate with PulseDC voltage, current or power operation; see chapter 4.3.3 for details,

## 3. **Timer Mode:** Up or Down – Fig.4.3.4



Fig.4.3.4

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Timer Mode* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

The following timer of operation are possible to set:

- *Up*: operation of DCMP-1500 is active continually and follows clock counting when HV ON is activated; time of operation is displayed at the main screen – see chapter 4.2.7 for details,
- *Down*: operation of DCMP-1500 is active only for the time period which has been set on the main screen and counts down when HV ON is activated; actual remain time is displayed at the main screen – see chapter 4.2.7 for details.

4. **Beep**: On or Off – Fig.4.3.5



Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Beeper* field; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

The following operation are possible to set:

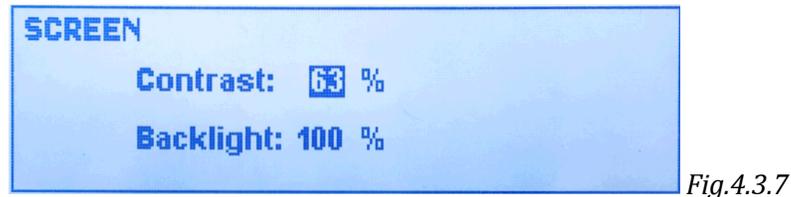
- *On*: any press buttons or knob operation of DCMP-1500 are confirmed by short beep sound; also, any error message end and of operation in case *Timer Down* operation, will be indicated by beep sound,
- *Off*: turns off all of the sound effects of DCMP-1500

## 4.3.2 SCREEN MENU

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Screen* tab; press **ENTER** button rotary knob to edit – Fig 4.3.6



the following window will pop-up:



The following options are possible to set then:

1. **Contrast**: the LCD contrast; adjustable from 30...100% – Fig.4.3.7

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Contrast* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

2. **Backlight:** the LCD brightness; adjustable from 10...100% – Fig.4.3.7  
Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Backlight* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

### 4.3.3 TARGET MENU

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Target* tab; press **ENTER** button rotary knob to edit – Fig 4.3.8



Fig.4.3.8

the following window will pop-up:



Fig.4.3.9

The target menu allows to set material names and target capacity for individual outputs. Also individual output names can be assigned here.

The following options are possible to set then:

1. **MATERIAL:** customized name of the output can be assigned here for convenience instead of “HV1” or “HV2” by default. This assigned name of output is displayed on main screen under the normal operation than – see chapter 4.2.2 for details  
Turn rotary encoder or use arrow buttons ▲ or ▼ to select *MATERIAL* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.
2. **CAP:** capacity of the used target is entered here in reference to the target manufacturer specification – Fig.4.3.10



Fig.4.3.10

Each output activation decreases target lifetime according to the used time. Remaining lifetime is automatically calculated and updated under the *REM* tab. Additionally consumption is presented as % in the live time bar at the main screen – see chapter 4.1.7 for details.

Remaining value can be reset at any time by choosing *Clear* tab – Remaining value come back to the entered capacity value than - *Fig. 4.3.11*

TARGETS			
GUN	MATERIAL	CAP(kWh)	REM(kWh)
1	HV 1	0	0 <input type="button" value="Clear"/>
2	HV 2	0	0 <input type="button" value="Clear"/>

Fig. 4.3.11

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *CAP* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

#### 4.3.4 LIMITS MENU

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Limits* tab; press **ENTER** button rotary knob to edit – *Fig 4.3.12*



Fig.4.3.12

the following window will pop-up:

LIMITS	
Power limit:	<input type="text" value="900"/> [W]
Voltage limit:	<input type="text" value="1000"/> [V]
Curent limit:	<input type="text" value="2000"/> [mA]

Fig.4.3.13

The following options are possible to set then:

1. **Power limit:** output power of DCMP-1500 can be limited with this option –

*Fig.4.3.13*

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Power Limit* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

**NOTE:** Power limit sets are different for DC or PulseDC mode. Max power limit for DC mode can be set up to 1500W, and PulseDC up to 1050W. See chapter 4.2.4 for details.

2. **Voltage limit:** output voltage of DCMP-1500 can be limited with this option –

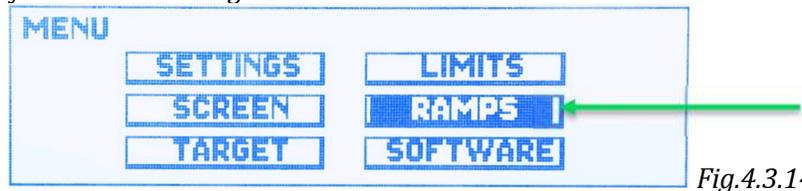
*Fig.4.3.13*. Max output voltage can be set from 200 .... 1000 V for any mode.

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Voltage Limit* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

3. **Current limit:** output current of DCMP-1500 can be limited with this option – *Fig.4.3.13*. Max output current can be set from 5 ... 3000 mA for any mode. Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Current Limit* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

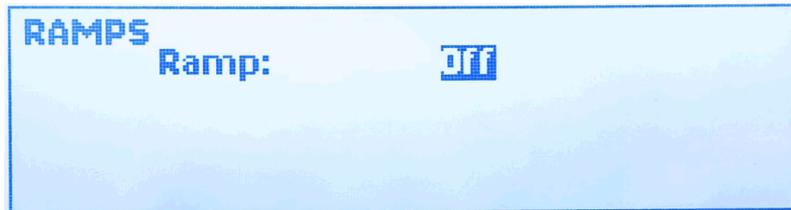
### 4.3.5 RAMPS MENU

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Ramps* tab; press **ENTER** button rotary knob to edit – *Fig 4.3.14*



*Fig.4.3.14*

the following window will pop-up:



*Fig.4.3.15*

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Ramp* tab; press **ENTER** button or rotary knob to activate the ramps options. Following window will pop-up – *Fig.4.3.16*



*Fig.4.3.16*

**NOTE:** Power ramp sets are different for DC or PulseDC mode. Max power ramp for DC mode can be set up to 1500W/s, and PulseDC up to 1050W/s. See chapter 4.2.4 for details.

1. **Power ramp:** output power of DCMP-1500 can follow the power ramp set. It can be set from 1...1500W/S for DC mode operation or from 1...1050 W/S for PulseDC mode operation. Units cannot be changed. Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Power ramp* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

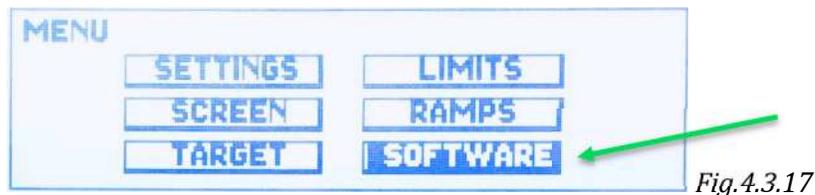
2. **Voltage ramp:** output voltage ramp of DCMP-1500 can be set with this option. It can be set from 1...1000V/s for any mode of operation. Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Voltage ramp* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.
3. **Current ramp:** output current ramp of DCMP-1500 can be set with this option. It can be set from 1...3000mA/s for any mode of operation. Turn rotary encoder or use arrow buttons ▲ or ▼ to select *Current ramp* tab; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

**NOTE:** If Ramps are activated, all of the ramps works simultaneously – it is independent from Constant Power, Voltage or Current operation.

**NOTE:** Sometimes there is a problem to start the plasma with some gases, target materials and vacuum conditions. Turn the Ramp option off and try again if any problem with plasma exist.

#### 4.3.6 SOFTWARE MENU

Turn rotary encoder or use arrow buttons ▲ or ▼ to select *SOFTWARE* tab; press **ENTER** button rotary knob to edit – *Fig 4.3.17*



*Fig.4.3.17*

Common information like software version is displayed here. – *Fig.4.3.18*



*Fig.4.3.18*

**NOTE:** Firmware can be upgraded by the user at any time. Refer to the “DCMP-1500 Firmware Upgrade manual” – contact with the manufactures for upgrades.

## 5. INTERFACE CONFIGURATION

### 5.1 ANALOG INTERFACE CONFIGURATION

The DCMP-1500 can be controlled by I/O analog interface. To configure I/O port as the master control of the device go to the *Control mode* tab and select *Analog* mode – Fig. 5.1.0 Turn rotary encoder or use arrow buttons ▲ or ▼ to navigate; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

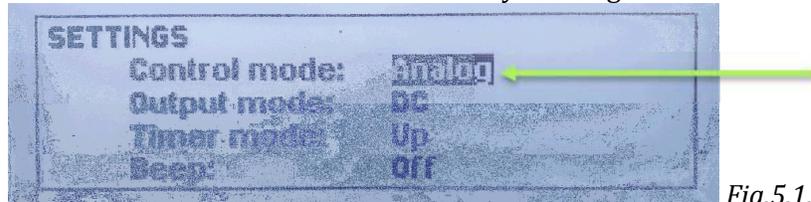


Fig.5.1.0

**NOTE:** no other settings for Analog interface are needed. For more hardware specification please refer to chapters 3.3.5 and 4.3.1 for details

**NOTE:** all Analog and digital outputs are active always – even when different interface is selected.

### 5.2 SERIAL RS232/485 INTERFACE CONFIGURATION

The DCMP-1500 can be controlled by the serial port as well. Only one kind of serial interface (RS232 or RS485) is available and it is up to hardware configuration during the order process.

To configure serial port as the master control of the device go to the *Control mode* tab and select *Serial* mode – Fig. 5.2.0 Turn rotary encoder or use arrow buttons ▲ or ▼ to navigate; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

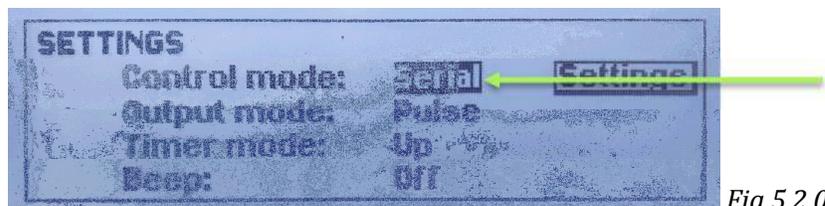


Fig.5.2.0

Go to the *Settings* tab with the next step to configure main parameters – Fig.5.2.1

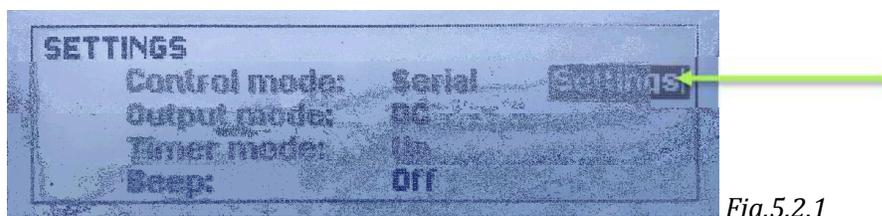


Fig.5.2.1

There are only two parameters to be set (Fig. 5.2.2):

- baudrate ( can be selected from: 2400 kBs, 4800 kBs, 9600 kBs, 19 200 kBs, 38 400 kBs, 57 600 kBs, 115 200 kBs)
- device address ( can be selected from 1 ..... 247 )

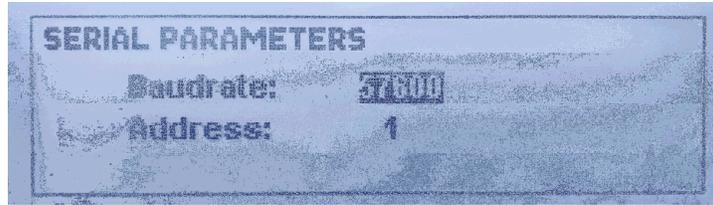


Fig.5.2.2

**NOTE:**

⇒No other settings for Serial interface are needed. For more hardware specification please refer to chapters 3.3.6 and 4.3.1 for details

⇒Unit address is used only for RS485 communication, where this parameter has to be different for each the same device in the same network

⇒If connection cannot be established, ensure about the proper address settings, and try to set slower baudrate

## 5.3 ETHERNET INTERFACE CONFIGURATION

The DCMP-1500 can be also controlled by Ethernet-LAN port.

To configure LAN port as the master control of the device, go to the *Control mode* tab and select *Ethernet* mode – Fig. 5.3.0 Turn rotary encoder or use arrow buttons ▲ or ▼ to navigate; press **ENTER** button or rotary knob to edit. Press **ENTER** button or rotary knob again to confirm the settings.

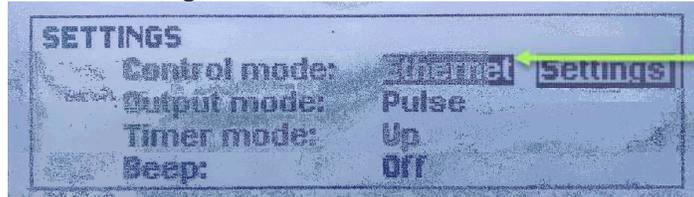


Fig.5.3.0

Go to the *Settings* tab with the next step to configure main parameters – Fig.5.3.1

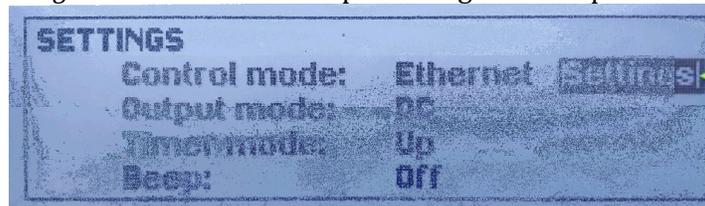


Fig.5.3.1

There are four parameters to be set (Fig. 5.3.2):

- DHCP on/off – manual or automating IP address assign,
- IP address (IPv4 standard),
- Net Mask – network mask
- Gateway – gateway of the connected network

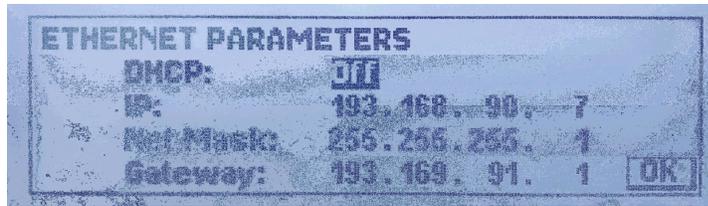


Fig.5.3.2

**NOTE:** as serial TCP ModBUS is implemented, the 5<sup>th</sup> parameter which Port it is, is by default set to 502

## 6. MAINTENANCE AND SERVICE

### 6.1 MAINTENANCE

The DCMP-1500 does not require any special maintenance work except filter cleaning and exchange.

**Important: Please check and exchange filters on the rear panel frequently. Do not remove EMI filters.**

To exchange the filters please use a flat screwdriver or knife and remove the upper fan cover – Fig. 6.1.0

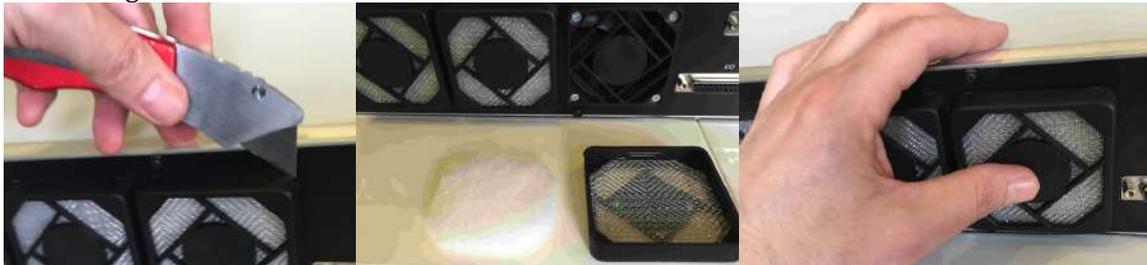


Fig. 6.1.0

Fig. 6.1.1

Fig. 6.1.2

Exchange the filters and put them back. Please take care to close the cover correctly - a click should be heard when pressing in place. See Fig. 6.1.2

Please contact the supplier for spare part numbers and pricing.

### 6.1.1 CLEANING

For cleaning the outside of the device, a slightly moistened cloth will do. Do not use any aggressive or abrasive cleaning agents.



*Mains voltage.* Components inside of the DCMP-1500 are components to mains voltage. Do not insert any objects through the louvers of the device. Protect the device from liquids. Do not open the device.

---

## **7. STORAGE AND DISPOSAL**

### **7.1 PACKAGING**

Please keep the original packaging. The packaging is required for storing the DCMP-1500 and for shipping it to a T&C Power Conversion, Inc. service center.

### **7.2 STORAGE**

The DCMP-1500 may only be stored in a dry room. The following requirements must be met:

Ambient temperature: -20...+60 °C

Humidity: as low as possible. Preferably in an air-tight plastic bag with a desiccant.

### **7.3 DISPOSAL**

The product must be disposed of in accordance with the relevant local regulations for the environmentally safe disposal of systems and electronic components.

## 8. TROUBLESHOOTING

Pos.	Error:	Problem description:	Solution:
1.	No reaction after powering on – LCD display stays dark; no LEDs illuminating	Probably power failure	<ul style="list-style-type: none"> <li>- check main cord connection,</li> <li>- check fuses in the main power socket – ref.. to section</li> <li>- Replace main cord</li> </ul>
2.	“No Interlock !!!” message when switching to operation mode ( HV on)	There is no hardware interlock connected	Check hardware interlock connection, or check external interlock source – refer to section: 3.3.5
3.	“Interlock lost !!! HV Off” message on LCD display	This message appears only when hardware interlock is missed during operation (when HV ON )	Check hardware interlock connection, or check external interlock source – refer to section: 3.3.5
4.	No output voltage, but maximum current appears ( „Imax” on LCD display )	The maximum current has been exceed	Probably output shortcut – check cable and the load connection
5.	No HV LED identification on when HV ON ( max. Current appears )	Probably output shortcut	Check cable and the load connection
6.	No HV LED identification on when HV ON ( 0 V and 0mA on LCD display )	Limits are set to zeros or internal HV module failure	Check Limits settings – section: 4.3.1
7.	„Over Temperature!” message	Internal temperature exceeded 65 °C during normal operation (HV ON)	Internal temperature too high – ensure the air flow on the rear side of the DCMP-1500 is correct, and that external temperature is not too high. Clean/exchange filters – see section: 6.1. Check if fans are rotating

## 9. WARRANTY CONDITIONS

### LIMITED WARRANTY

T&C Power Conversion, Inc. warrants to the purchaser or end user of the equipment it sells that such equipment will be free from defects in material and workmanship under normal use and service. This warranty is for a period of 27 months from the date of original shipment or two years (24 months) from the date the equipment is placed in use by the purchaser or end user thereof, whichever occurs first. This warranty is void if the equipment is not used, operated, and maintained in accordance with the manual accompanying the equipment. T&C Power Conversion, Inc. shall not be responsible for any direct or indirect loss or damage resulting from accident, negligence of a user, alteration, abuse, or misuse of the equipment. Upon acceptance of this Limited Warranty, purchaser waives all warranties, guarantee, or remedies not specifically stated in this Limited Warranty. This warranty does not cover ordinary wear and tear or expendable components.

T&C Power Conversion, Inc.'s obligation under this Limited Warranty is, at T&C Power Conversion, Inc.'s option, to repair or replace any defective equipment or parts of the equipment, without charge to the purchaser, which are returned, shipping prepaid, to the T&C Power Conversion, Inc. facility. For return or repair of equipment, purchaser must contact T&C Power Conversion, Inc. for a Return Materials Authorization (RMA) prior to shipment of the equipment to T&C Power Conversion, Inc. If T&C Power Conversion, Inc. has designated an Authorized Warranty Service Representative in the purchaser's country, contact may be made with the Authorized Warranty Service Representative and defective equipment may be delivered to such Authorized Warranty Service Representative to service warranty claims.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranties of merchantability and fitness for any particular purpose. The purchaser acknowledges the purchaser is not relying in T&C Power Conversion, Inc.'s skill or judgment to select or furnish equipment suitable for any particular purpose.