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# **PLASMA CUTTER**

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## **Operating Manual**

### **For**

**CAT250D/CAT250DP/CAT416D/CAT416DP**  
**CT416/CT416P/CT416D/CT416DP**  
**CT520/CT520P/CT520D**  
**CT520DX/CT520DP**

**Notice:**

You can find that below detail not include all above models, Because:

CT=CAT, "D" means Dual voltage, 250=520

"P" means pilot arc, "DP" means Dual Voltage With Pilot Arc

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## EC DECLARATION OF CONFORMITY

We hereby declare that our machines for industrial and professional use as stated below

Type:CT416, CT520

Conforms with EMC Directives:

73/23/EEC and 89/336/EEC

European Standard: EN/IEC60974

Please read and understand this instruction manual carefully before the installation and operation of this equipment.

The contents of this manual may be revised without prior notice and without obligation.

This instruction manual is issued on 1<sup>st</sup> Jan 2009.

## WARNING

Welding and cutting is dangerous to the operator, people in or near the working and surrounding areas, if the equipment is not operated correctly.

Therefore the performance of welding/cutting must only be under the strict and comprehensive observance of all relevant safety regulations.

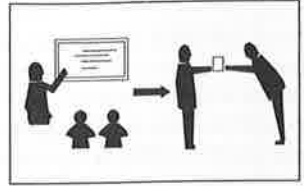
Please read and understand this instruction manual carefully before the installation and operation of this machine. The switching of function modes during cutting or welding is prohibited lest damage to the equipment may occur.

Do disconnect the arc/mma electrode-holder cable from the equipment before either plasma cutting or tig welding.

The circuit supplying the machine should be properly fused according to the National Electrical Code and local electrical codes.

Welding tools should be of high quality.

Operators should be qualified.



### Electric Shock: It's may be fatal

Connect the earth cable according to standard regulation.

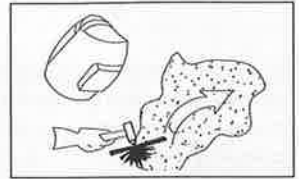
Avoid all contact with live components of the welding circuit, Electrodes and Wires with bare bands, It's necessary for the operator to wear dry welding Gloves while who performs the welding task.



### Smoke and gas generated while welding or cutting: Harmful to health of people

Avoid breathing the smoke and gas of welding or cutting.

Keep the working area in good ventilation



### ARC light-emission: Harmful to the eyes & skin of people

Wear a welding helmet, Anti-radiation glass and work clothes while the welding Operation is performed.

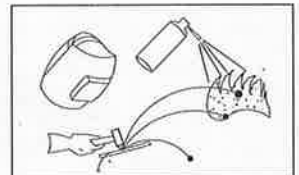
Measures also should be taken to protect people in or near the working area.



### Fire Hazard

Sparks from welding or cutting may cause fire, Thus remove flammable Material from the work place.

Have a fire extinguisher nearby and have a trained fire person ready to Use it.



### Noise: Possibly harmful to hearing of people.

Noise is generated while welding/cutting therefore hearing protection Is necessary.

### Machine Fault:

Consult this instruction manual.

Contact your local dealer or supplier for further advice



## GENERAL DESCRIPTION

This welding & cutting equipment is manufactured with advanced inverter technology. With power Component mosfets and adopting PWM technology, 100KHz frequency AC voltage; as a consequence, the voltage is transformed and rectified, Therefore, It results the much more small-sized of the main transformer and lighter in weight of the inverter welding/cutting equipment, which rates the performance of cutting by 30%. The high frequency oscillation, which enables the output of the high frequency DC, is employed in the arc-starting system. The features of this product are as following: stable output, reliable, completely portable.

CT416 and CT520 are models of welding & cutting equipment of three functions: TIG, MMA and CUTTING. During the operation of MMA welding or TIG welding, this welding & cutting equipment is featured with the stability of output. The stability of the welding current output is not frustrated by variation of arc length. During the plasma cutting operation the arc temperature rises rapidly up to 10000-15000 and produces the powerful plasma arc for cutting. By the employment of plasma cutting, It is energy saving and efficient; the high speed of metal cutting and smooth incised surface is possible.

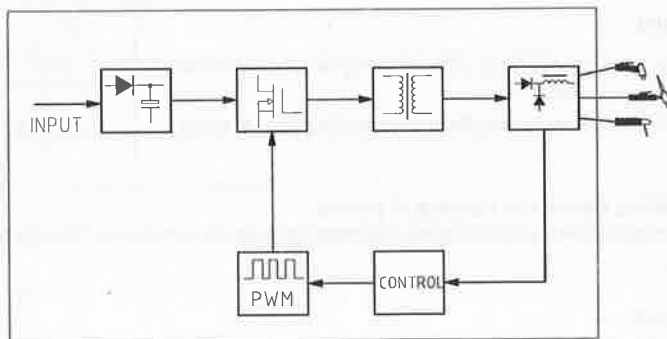
CT 416 and CT520 are applicable in welding and cutting of various kinds of metal materials, such as carbon steel, stainless steel, alloy steel, copper and other nonferrous metals etc. Also they are small in measurement, high efficient, energy saving, stable in output and reliable in quality; the efficiency ratio of input voltage and output voltage of this welding & cutting equipment is up to 85%.

Guarantee of maintenance for main inverter of this welding & cutting equipment is three years, excluding other spare parts.

During the guarantee period all repair of all parts and labor are free of charge, excluding shipping and the deliberate damage to this welding & cutting machine.

Only qualified technicians are authorized to carry out the repair task of this welding & cutting equipment in case of machine fault.

### Block Diagram

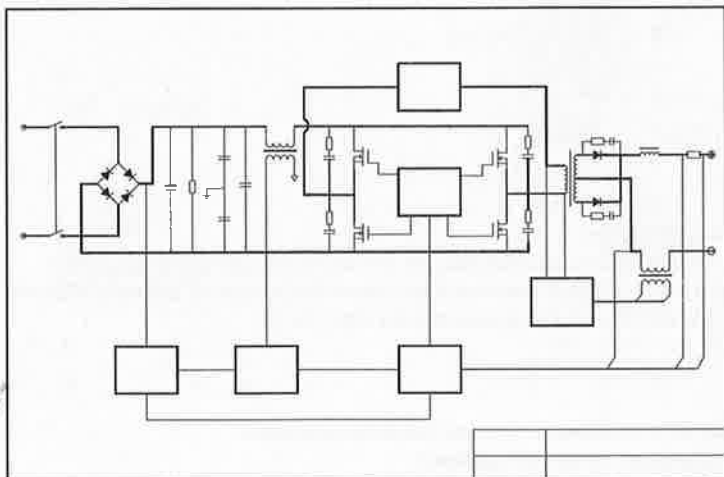


## MAIN PARAMETER

TYPE	CT416D	CT520D
Input Voltage (V)	110/220±15%	110/220±15%
Input Frequency (Hz)	50/60	50/60
Consumption (KVA)	4.2	6.3
No-load Loss (W)	35	45
Duty Cycle (%)	60	60
Power Factor	0.93	0.93
Efficiency (%)	85	85
Insulation Class	B	B
Protection Class	IP23	IP23
Weight (Kg)	13	13
Size (mm)	425*205*355	425*205*355

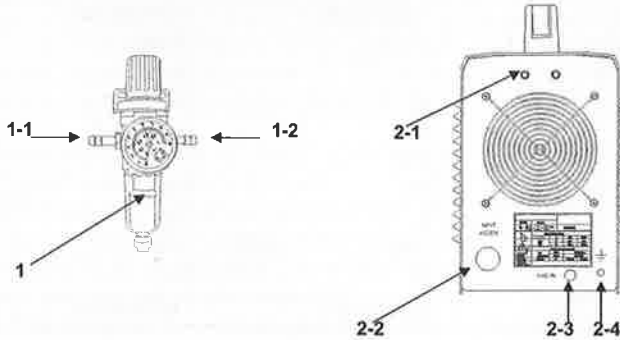
Type	CT416			CT520D		
	ARC	TIG	CUT	ARC	TIG	CUT
Input Current (A)	15	10.2	22	22	20	27.3
Output Current (A)	125	160	40	160	200	50
Current Range (A)	10-125	10-160	10-40	10-160	10-200	10-50
No-load Voltage (V)	25	15	220	27.5	18	250
Working Voltage (V)	55	55	92	62	62	110
Nozzle Internal (mm)			Ø1.0			Ø 1.2
Air Pressure (MPa)			0.4			0.4
Gas Flow (L/min)		2--5	80		2--5	80
Applicable Thickness(mm)		1—6	1-15		1—9	1-25
ARC Starting	Touch	HF	Touch	Touch	HF	Touch

## CIRCUIT DIAGRAM



# INSTALLATION

## INSTALLATION DIAGRAM OF CUT & CT SERIES.



### 1. Air regulator

This is air regulator, This part is supplied along with machine, You will see it after you open carton.

1-1. This terminal fix on a side of hose for air in, another side of hose connecting air compressor

1-2. This terminal fix one side of hose for air out. Another side of hose for fix on picture 2-3.

### 2. Back of machine.

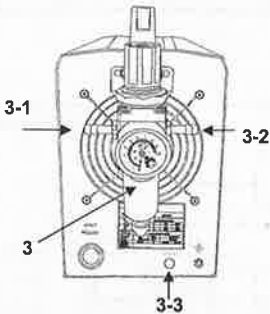
This is back of machine, Air regulator will be fixed there.

2-1. This is screw for fix air regulator. Please be sure screw fasten after fix it.

2-2. This is power cable, Connecting 220V or 110V.

2-3. This is air in, A terminal of hose connecting here, Another terminal connecting air regulator 1-2

2-4. Do not use this connection, Please just ignore it.



### 3. Installation of machine.

3-1. The terminal of hose connecting here, Another side of hose connect air compressor

3-2. A short hose is supplied, a terminal of hose connecting position 3-2, another side connect on 3-3

3-3. This terminal for air in. The air input from 3-1 via 3-2 to 3-3.

**Note:** Please to be sure keep air into machine before you use it.

### How to installation of the air regulator:

Please refer to the right drawing.

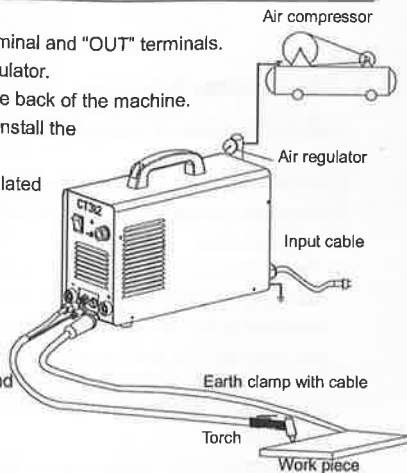
The installation and operation of the air regulator.

- 1) Seal the connection of the copper gas fitting and the "IN" terminal and "OUT" terminals.
- 2) Connect the regulator seal to the installation place of the regulator.
- 3) Install the regulator bracket to the two screws at the top of the back of the machine.
- 4) Remove the mounting ring from the top of the regulator and install the regulator to the mounting bracket and re-attach with ring.
- 5) Release the gas valve, modulate the pressure of gas to stipulated pressure and press the button
- 6) The gas pressure is 4 times of normal atmospheric pressure.
- 7) In case that the water-filtering bottle is full with water remove the water.

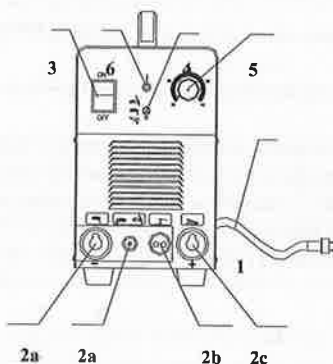
**Please note that:**

Please choose the gas supply respectively for TIG welding and plasma cutting are different.

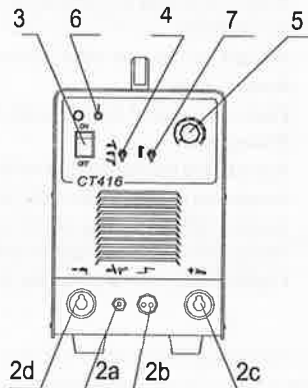
The duty cycle for cutting of CT416/520 is 60%



**CT312**



**CT416/520**



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# OPERATION

## 1. TIG welding function

- 1) While this welding & cutting equipment is operated, Power supply indicator is on, and the built-in fan is functioning.
- 2) Position the mode selection switch to TIG
- 3) Press the gas-releasing button and adjust the volume of gas output on your argon regulator to the Required value.
- 4) Press the button of welding torch, and the electromagnetic valve functions. The sound of electricity releasing is audible and there is gas out from welding torch. Please note that: before the initial welding operation, press the button of welding torch for several seconds in order to remove the gas inside the gas tube, and the welding operation is accessible. There is gas output within a few seconds after the welding operation, That is special design to protect the welding point before it is cooling down. Therefore, after the extinction of arc, maintain the welding position to abstract the heat produced during the welding operation.
- 5) The welding current output is adjustable, according to the thickness of welding material an required craftsmanship.
- 6) Maintain the distance of 1-4mm between the tungsten electrode and the work piece and the work piece occurs; after the arc starting, the splash of HF arc starting will vanish and the welding operation is available

## 2. MMA Function

Position the mode selection switch to ARC

While this welding & cutting equipment is operated, The power supply indicator is on, and the built-in fan is functioning.

According to the thickness of work piece, adjust the welding current output and choose the rod, Then the ARC welding mode is ready.

## 3. PLASMA Cutting function

Position of the mode selection switch plasma-cutting mode.

While this welding & cutting equipment is operated, The power supply indicator is on, and the built-in fan is functioning.

Release the regulator valve, and modulate the pressure and volume of output air, Normally 70 PSI or 4.5 if A metric gauge.

Press the button of the cutting torch. The sound of electricity releasing is audible and there is air out from Plasma torch.

According to the thickness of work piece, Adjust the current output, then plasma cutting is accessible.

Contact the nozzle of the cutting torch with the work piece, Press the button of the welding torch, The Sound of HF arc starting vanishes and the cutting operation is accessible, after the arc starting, Maintain The distance of about 1mm, In order to protect the nozzle from possible damage.

I case of difficulty in arc starting, It is recommended to reduce the pressure of gas output.



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## CAUTIONS

### 1. Working environment

- 1.1 The location in which this welding & cutting equipment is installed should be of little dust, corrosive Chemical gas or materials, and for maximum 80% humidity.
- 1.2 Avoid the operation of welding & cutting outdoors unless sheltered from the sun, rainwater and snow etc; The temperature of working environment should be maintained within -10°C to +40°C.
- 1.3 Keep this welding & cutting equipment 30cm distant from the wall;
- 1.4 Keep the working environment in good ventilation.

### 2. Safety tips

#### 2.1 Ventilation

This welding & cutting equipment is small-sized, compact in structure, and of excellent performance in current output. Fans are required to abstract heat and smoke generated by this cutting equipment while the operation of welding is carried out.

#### **Cautions:**

Maintain good ventilation of the louvers of this welding & cutting equipment, The minimum distance between this welding & cutting equipment and any other object in or near the working area should be 30cm. Good ventilation is of critical importance for the normal performance and service life of this welding & cutting equipment.

#### 2.2 Welding operation is forbid while this welding & cutting equipment is of over-load.

A sudden halt may occur while the cutting operation is carried out while this welding & cutting machine is Of over-load status. Under this circumstance, It is unnecessary to restart this welding & cutting equipment. Keep the built-in fan working to bring temperature down inside this welding & cutting equipment.

#### 2.3 Over-voltage is forbid.

Regarding the power supply voltage range of the welding & cutting machine, please refer to main Parameter table. This welding & cutting equipment is of automatic voltage compensation, Which enables The maintaining of the voltage range within the given range. In case that the voltage of input power supply Current exceeds the stipulated value, It is possibly damaging to the components of this welding & cutting Equipment.

#### 2.4 It is strongly forbid to contact the output terminal while welding or cutting is performed. An electric shock Possibly occurs.

## MAINTENANCE

Exposure to extremely dusty damp or corrosive air is damaging to this welding & cutting machine. In order to prevent any possible failure or fault of this welding & cutting equipment clean the dust at regular intervals with Clean and dry compressed air of required pressure.

Please note that: lack of maintenance can spell to the unavailability and cancellation of the guarantee; The guarantee, of this welding & cutting equipment will be no longer available in case that it has been attempted to take the machine apart or the open the factory-made sealing of the machine.

## TROUBLESHOOTING

**CT416/520**

**CAUTIONS:** Only the qualified technicians are authorized to undertake the repair task

Fault symptoms	Rectification
1. While this welding & cutting equipment is off, The built-in fan is not functioning and there is no output	<ol style="list-style-type: none"> <li>1. Possible damage of power supply switch, compensate damage if Necessary</li> <li>2. Possible unavailability of power supply. Check and compensate the Failure if necessary.</li> <li>3. Possible short-circuit of the input cable. Check it and compensate it if Necessary</li> </ol>
2. While this welding & cutting equipment is operated, the pilot lamp is on, no output, Built-in fan unavailable.	<ol style="list-style-type: none"> <li>1. Possible misconnection with input of 380V, and occurrence of over voltage protection status. Reconnect with input of 220v, and restart.</li> <li>2. Possible unstable input due to the un-available input cable or possible connection unavailable spells it's being of over-voltage protection status.</li> <li>3. Frequently switching on and off of this welding equipment in a short period leads this equipment's being of over-voltage protection. Switch off this welding machine and wait for at least 3 minutes, Then restart this welding equipment.</li> <li>4. Possible unavailability of the connection of switch and bottom PCB. Reconnect it.</li> <li>5. The 24V relay of bottom PCB is possibly damaged, Replace it if necessary.</li> </ol>
3. While this welding & cutting equipment is operated, The built-in fan functions, the fault indicator is off, no HF electricity releasing, ARC starting unavailable.	<ol style="list-style-type: none"> <li>1. The normal voltage of positive and negative pole of board VH-07 should be DC 380V possible short circuit occurs, and possible unavailability of connection of silicon bridge with the PCB. possible electricity leakage if capacitors, replace them if necessary.</li> <li>2. A green light indicator of secondary power supply top PCB should be on. Otherwise, it indication that the secondary power supply is not functioning check the connection whether is available. If fault can not rectified, please contact the supplier for further advice.</li> <li>3. Possible unavailable of connection inside this welding equipment occurs. Check and reconnect if necessary.</li> <li>4. Possible malfunction of control circuit occurs. Check otherwise contact the supplier for further advice.</li> <li>5. Possible damage of welding torch. Replace if necessary.</li> </ol>
4. While this welding & cutting equipment is operated, Fault indicator is off, HF electricity releasing is available and Welding current output is unavailable.	<ol style="list-style-type: none"> <li>1. Possible disconnection of welding torch cable.</li> <li>2. Possible disconnection of earth cable, or unavailability of connection of the earth cable and work piece.</li> <li>3. The connection between positive output terminal or the gas or electricity output terminal and this welding equipment is possibly unavailable. Reconnect them if necessary.</li> </ol>
5. While is this welding & cutting equipment is operated, The fault indicator is off, no electricity releasing and arc starting available.	<ol style="list-style-type: none"> <li>1. The cable connection between the transformer of arc starting and power PCB is possibly unavailable. Check and reconnect it.</li> <li>2. Possible oxidization of electricity releasing parts occurs. Or the distance is larger than the maximum distance available, remove the oxidization of the <b>electricity</b>. Releasing the <b>parts</b> and adjust the</li> </ol>

	<p>distance of the electricity. Releasing parts to range of 1mm</p> <ol style="list-style-type: none"> <li>Possible damage to MMA/TIG switch. Replace them if necessary.</li> <li>Components of HF arc starting circuit are possibly damaged, Check and replace them if necessary.</li> </ol>
6. While this welding & cutting equipment is operated the fault indicator is on, and there is no Output.	<ol style="list-style-type: none"> <li>It is possible of over-current protection status. Switch off the power supply, wait till the fault indicator is off, and restart this welding equipment.</li> <li>It is possible of over-heating protection status. Wait till the fault indicator is off, and the welding operation will be available.</li> <li>Possible fault with inverter circuit, Disconnect the power supply plug VH-07 of transformer of top PCB, And restart this welding equipment. <ol style="list-style-type: none"> <li>If the fault indicator is still on. Switch off the power supply of this welding equipment disconnect the power supply plug VH-03 of HF arc starting. <ol style="list-style-type: none"> <li>If the fault indicator is on, Mosfets of top PCB is possibly defective, replace it if necessary.</li> <li>Possible damage of transformer of center PCB. Replace it if necessary.</li> </ol> </li> <li>If the fault indicator is off <ol style="list-style-type: none"> <li>Possible damage of transformer of center PCB, replace it if necessary. Measure the inductance value and Q value. <math>L=0.9-1.6mHQ&gt;35</math>. If both of the inductance value and Q value are comparatively low replace them.</li> <li>Possible damage of secondary rectifier of transformer. Replace it if necessary.</li> <li>Possible damage of relay of center PCB. Check and replace it if necessary.</li> </ol> </li> </ol> </li> <li>Possible damage of feed back circuit compensate the fault if necessary.</li> </ol>
7. Unstable current output during the welding operation and the potentiometer is unavailable	<ol style="list-style-type: none"> <li>Possible damage of 1K resistance, Replace it if necessary,</li> <li>The connection of this welding equipment is not available.</li> </ol>
8. Excessive splash generated during welding operation, It is difficult to weld with alkaline rod	<ol style="list-style-type: none"> <li>Misconnection of earth cable and welding torch cable.</li> <li>Reconnect them.</li> </ol>
9. Insufficiency in welding and cutting performance and the arc is not stable.	<ol style="list-style-type: none"> <li>Possible insufficiency of voltage input.</li> <li>The connection of earth cable is unavailable, Reconnect it.</li> <li>The gas supply system is unavailable. Examine it and compensate it if necessary.</li> <li>There is possible deficiency of electrode of cutting torch, Compensate it.</li> <li>The filter capacitor of this welding &amp; cutting equipment is not available. Replace it if necessary.</li> <li>The rod is not available, due to the fact that the rod is been affected with damp or unqualified.</li> <li>The current is not available to start the arc.</li> </ol>

## SPARE PARTS LIST



	DESCRIPTION	CT312 PART NO.	CT416/520 PART NO.
1	Front panel	J02041	J02019
2	Cover	J03235	J03233
3	Handle	J24005	J24005
4	Button	C16001	C16001
5	Coupling socket	C02015	C02015
6	Main switch	C16001	C16001
7	Knob socket	B01010	B01010
8	Pilot-socket ( 2 pins )	C04001	C04001
9	Heat sink	J20003J20004	J20003J20004
10	Input cable	C08608	C08608
11	Fan	B15002	B15002
12	Rubber foot	J24009	J24009
13	Center PCB	B02006	B02007
14	Bottom PCB	B03010	B03014
15	Top PCB	B01016	B01017
16	Electromagnetic valve	B10002	D27003

