INSTRUCTION MANUAL FOR AIR PLASMA CUTTING MACHINE

MODEL –WAP 15/30

WARPP ENGINEERS PVT.LTD.

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TABLE OF CONTENTS

ILLUSTRATIONS

1. THE PROCESS:

Plasma is the fourth state of matter, others being the solid, liquid and gaseous. When a gas is heated to high temperature it changes from molecular state to ionic state. Plasma is electrically conductive as it contains charged particles.

2. SAFETY PRECAUTIONS:

- The mains connection must be properly grounded and the supply lines be fitted with fuses of Specified ratings. The mains cable must be properly secured to prevent possible damage.
- High voltage exists on the torch when power is applied and the pilot arc is struck and when the main arc is cutting.
- The nozzle should not be touched when the power is applied to the torch.
- All Adjustments and replacements of the parts should be undertaken with the unit switched off.
- The torch should not be used in excessively wet conditions.
- Power supply to the unit should be switched off before removing any panel of the machine Keep the work area clear from all inflammable materials. Ensure that any material or spark ejected from the cut is not a source of danger to the operator or others.
- Protection is necessary from the ultraviolet radiation emitted by the arc. A helmet with shade glass and gloves should be used while cutting. Adequate screening should be provided to protect others working in the vicinity from ultraviolet radiation.

3. EQUIPMENT DESCRIPTIONS:

The unit consists of following.

- **Power Transformer.**

The power transformer used in this unit is a constant current type transformer with drooping characteristics. The transformer is made of copper coils and F class insulation is used for safety and trouble free performance for a long time. Interlayer air gap is provided in the coils for sufficient cooling.

- **Rectifier.**

Three phase full wave silicon rectifier stack is used to convert the AC output of the transformer to DC. Heat sink of proper rating is employed to see that the diodes doesn't heat up and cause damage to the rectifier.

- **Central Processing Unit (CPU).**

This unit is an electronic PCB which is the brain of the system. This unit controls the sequence of operation and also detects any malfunctioning in the system. In the event of this occurring this will automatically shut down the machine to prevent any damage to the torch or operator.

- **Arc Starting System.**

When the switch on the torch is initiated an arc is created between the electrode and the nozzle in the torch. This arc which ejects out of the nozzle is called pilot arc. When this pilot arc comes in to contact with the job, main arc is created and the cutting starts.

- **Sensors.**

Sensors are provided to sense the air failure with auto feed back systems. If the air Supply drops below the rated pressure the machine will automatically shutdown and air failure indicator on the from panel will glow. The Machine comes back to operation only when the air pressure is resumed to the normal required pressure.

4. FRONT PANEL CONTROLS.

- ON-OFF-TEST three way selector switches.
- MAIN ON/OFF Switch
- Mains Power indicator, Panel Fuse.
- Air Failure indicator / water failure indicator.
- Thermal overload indicator.
- Air Pressure gauge.
- Air Line to the torch with power manifold.
- Pilot arc connection to the torch.
- Remote control socket (Torch Trigger).
- Job Power Return Cable (Job Earth).

5. THE TORCH:-

The torch is a precision tool precisely molded with internal parts perfectly aligned. Although the torch has been designed to withstand normal workshop abuse care should be taken to ensure that the torch is not excessively knocked about and is maintained properly.

- **Basically there are two types of torches:-**

A. Hand Torch
B. Machine Torch

- **Hand cutting torch has three connections:-**

a) Air line with main power manifold.
b) Pilot Arc Connection.
c) Remote (Torch Trigger)

- Machine torch has only the first two connections and a separate ON-OFF remote pendent is required.

6. CONSUMABLES.

The torch carries a number of elements known as spares and consumables which are either eroded or consumed while cutting (Ref to Torch assembly Diagram)

While replacing the consumables procedure should be followed and care must be taken to see that cleanliness is of utmost importance.

CAUTION: THE EQUIPMENT MUST BE SWITCHED OFF BEFORE REPLACING THE CONSUMABLES.

- Unscrew the Nozzle retaining cap
- Unscrew the nozzle (Thread less)
- Remove the Swirl ring
- Check the condition of the electrode if it is to be removed then unscrew it with the spanner and replace it.

CAUTION: STOP CUTTING IMMEDIATELY IF GREENISH ARC IS OBSERVED WHILE CUTTING OR CUTTING SOUND CHANGES.

This happens when the insertion material in the electrode is consumed.

7. PRE INSTALLATION REQUIREMENT.

Mains Power:-

- Three phase 380-440 Volts 50 Hz switched fuse box with a capacity of 32 Amps.

Mains Input Cable:-

- Use three 7/20 copper cable for the input connection with a separate earthing cable.

Air:-

- External compressor rated 300 liters/min at about 5 kg/cm2 (Ideally 5-HP or more Double cylinder Compressor)

8. PRE STARTING CHECKLIST.

- Ensure that the fuses in the fuse switch box are of proper rating and have proper contacts
- Ensure that the power cable is tightened at all connections.
- Ensure that the proper earthling is provided to the machine.
- Ensure that job has been firmly connected to the job stud using earthling clamp and cable.
- Make sure that all the consumables and spares are fitted inside the torch.

NOTE: FOR INSTALLATION REFER TO INSTALLATION DIAGRAM IN THIS MANUAL.

9. CUTTING PROCEDURE.

Switch on the mains supply from the switch fuse box. The mains indicator will glow irrespective of the position of ON-OFF-TEST selector switch. This is a safety feature which indicates that power is supplied to the unit.

Open the air supply and adjust the air pressure around 75 PSI. This adjustment can be done using the regulator connected at the back side of the machine and pressure gauge at the front panel.

Move the selector switch on the front panel to test position, now the sparks can be seen between the electrode and nozzle. This exercise confirms the proper connection of the torch to the machine.

CAUTION: NEVER LEAVE THE SELECTOR SWITCH IN TEST POSITION

Move the selector switch on the front panel to RUN Position

Place the torch at the edge of the plate where the cutting has to be started. Press the initiating button on the torch to get the pilot arc. Main arc will be established when the pilot arc touches the plate. Now the torch can be moved along the plate at a clearance of 3 to 8 mm.

CAUTION: DO NOT TOUCH THE TORCH TO THE PLATE.

Speed of cutting is very important and will determine the quality of the cut, life of consumables and hence the economy of cutting. Always ensure that the arc has penetrated the plate. The torch should be moved evenly ensuring that the arc does not come up but has an angle of 45 degree under the plate and trailing behind the torch.

The arc will shut off automatically when the torch reaches the end of the plate. However if the arc has to be shut off in between then the initiating button on the torch has to be released.

In case of machine torch once the cutting is started the cutting continues even after releasing the START button on the remote control pendent. The cutting stops when it reaches the end of the plate. If the cutting has to be stopped in between then the STOP button on the remote control pendent has to be pressed.

10. MAINTENANCE:-

Check the following

- **Daily**
  - Condition of the torch consumables.
  - Drain the air filter.
  - Ensure that drain cork is tightened properly.
  - Check for air leaks.
  - Check the air pressure setting to be around 75PSI.

- **Annually**
  - Air intake filters Maximum Air delivery.
  - Free running of Fan.
  - Tightness of all electrical connections.
  - Operation of all control indicators.
  - Blow away all the dust inside the machine by Blower.

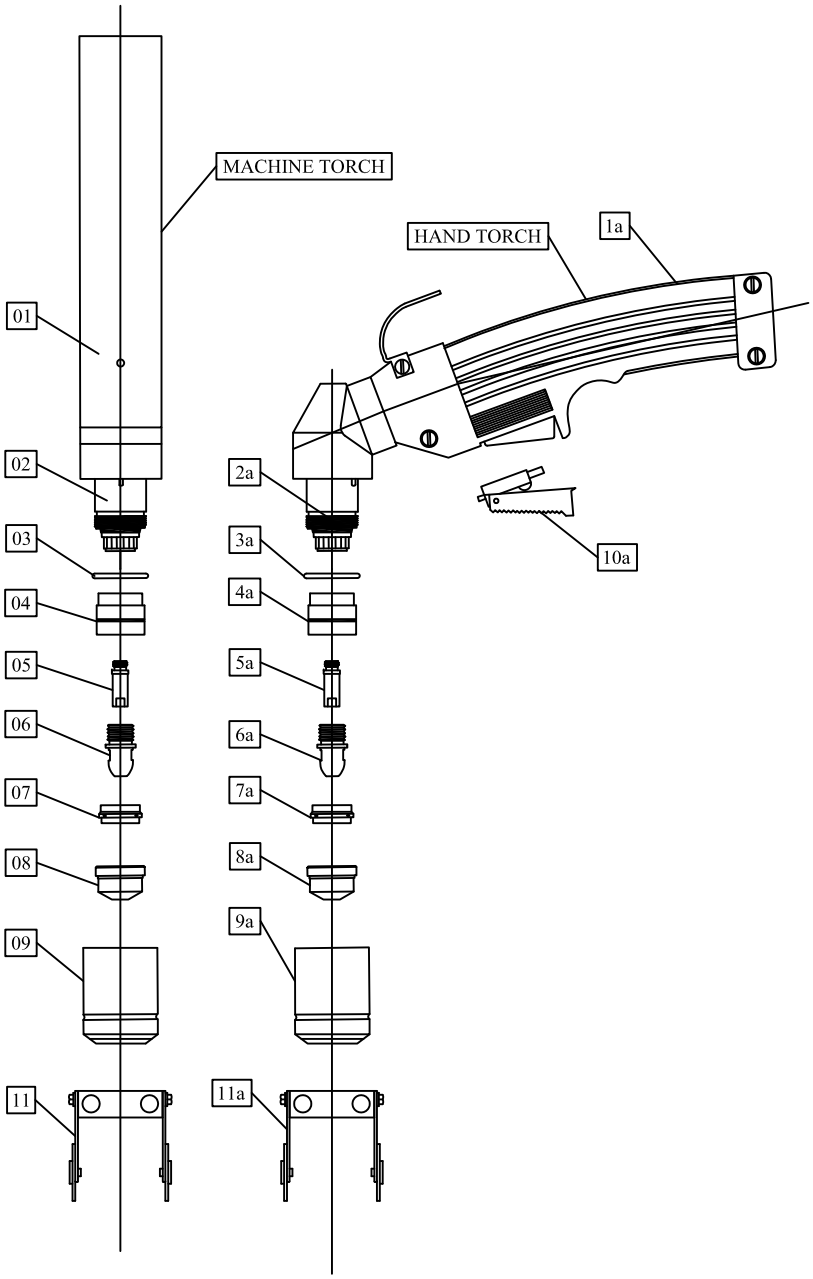
CAUTION: IF THE POWER CABLE INSIDE THE NYLON BREADED PIPE IS EXPOSED IMMEDIATELY REPLACE THE ENTIRE PIPE. DO NOT TRY TO PATCH UP THE PIPE; THIS WILL GIVE RISE TO SAFETY HAZARD.

11. FAULT FINDINGS

FAULT	CAUSE	REMIDY
Main indicator does not glow when the power is supplied to the Unit.	Mains Fuse is Blown off Panel Fuse is blown off	Replace the main fuse Replace the panel fuse (5 Amps)
Put the selector switch in RUN position and the initiating button on the torch is pressed but no Pilot Arc.	Improper connection of the remote control socket	Make proper connection
	Air Pressure	Adjust the air pressure and make sure that air failure indicator does not glow.
	Transformer gives a huge humming Noise	Diodes have been blow off, Replace diodes.
	Check electrode and nozzle for bad condition	Replace if necessary
	Electrode nozzle Shorting	Properly fit the electrode.
No Sparking in the torch	Check the loose connection at the pilot arc stud	Make proper connection.
	Open the top cover and see the spark in the spark plug is bright enough	Clean the spark plug adjust the gap to 2mm (Approx) or replace the spark plug.
No Sparking in the spark plug itself	Loose connection at the auxiliary point of the main contactor	Make firm connection
Pilot Arc is coming but no cutting	Check for the proper fitting of JOB EARTH	Make firm connection
	Main fuse is blown off (Even two phase may give you pilot arc but no cutting is possible)	Replace the fuse.
	Input power Supply	Input supply must be between 380-440 Volts
	Loose connection in the input supply	Make firm connection
Rough Cutting/ bad Finish	Cutting Speed is not proper	Maintain proper speed
	Air Pressure	Keep proper air pressure
	Moisture in the air	Drain the air filter and compressor tank
	Bad condition of Nozzle	Replace the nozzle
Electrode and nozzle is consumed at high rates	Moisture in the air	Drain the filter and compressor tank.
	Leakage in air line	Correct the air leakage
	Improper fitting of contact tube	Properly fit the contact tube.

LIST OF SPARE PARTS FOR WAP-15/30		
Description	**WAP-15**	**WAP-30**
D.C.Contactor	C2305	C2305
Contactor	C2304	C2301
HT Transformer	C140206	C140206
NETWORK 4	C2450	C2450
NETWORK 3	C2449	C2449
PCB	C170106	C170106
Pressure Switch	C2221	C2221
Pressure Gauge	C2607	C2607
Exhaust Fan	C160201	C160201
Primary Coil	C1109	C1110
Secondary Coil	C1116	C1117
Diode	C150606	C150606
Read Switch	C2447	C2447
Selector Switch (RUN-OFF-TEST)	C2220	C2220
Indicator Red	C2408	C2408
Brass Quick Coupler	C2515	C2516
Power Plug Metal Type (3 Pin male)	C2411	C2411
Resistor 1K Ohm 100 W	C2103	C2103
Resistor 25 Ohm 100W	C2101	C2101
Resistor 12.5 Ohm 400 W	C2102	C2102
Spark Plug (MICO Only)	C2432	C2432
Brass Elbow	C2512	C2512
Brass T	C2513	C2513
Control Transformer	C140606	C140606

R.NO.	REVISIONS	R. DATE	R. BY	R. CHD.



A-90 TORCH

DESCRIPTION AND CODE NUMBER MACHINE TORCH

SR.NO.	DESCRIPTION	CODE NUMBERS
01	Machine Handle	T2116
02	Machine Torch Head	T2106
03	O-Ring	T1202
04	Front Insulator	T1105
05	Diffusor	T0607
06	Electrode	T0702
07	Swirl Ring	T1109
08	Tip	Ø1.1mm=T0801 / Ø1.4mm=T0802
09	Nozzle Retaining Cap	T1101
11	Torch Guide Roller	C2128

DESCRIPTION AND CODE NUMBER HAND TORCH

SR.NO.	DESCRIPTION	CODE NUMBERS
1a	Handgrip complate with switch	T2108
2a	Hand Torch Head	T2101
3a	O-Ring	T1202
4a.	Front Insulator	T1105
5a	Diffusor	T0607
6a	Electrode	T0702
7a	Swirl Ring	T1109
8a	Tip	Ø1.1mm=T0801 / Ø1.4mm=T0802
9a	Nozzle Retaining Cap	T1101
10a	Switch	T1107
11a	Torch Guide Roller	C2128

REMOVE ALL SHARP EDGES BY 1.0x45°; UNLESS OTHERWISE SPECIFIED

ANGULAR DIMN.			SURFACE FINISH	
L		TOL.	SYMBOL	MICRON
OVER	UPTO			8 - 25
1	6	± 1°		1.6 - 8
6	30	± 30'		0.025-1.6
30	120	± 20'		< 0.025
120	400	± 10'	MACHINING TOL.	
			OPEN DIMNS. AS	
			PER IS:2102 1969.	
			DIM.IN mm	

LINEAR DIMNS.						
OVER	—	6	30	120	315	
UPTO	6	30	120	315	1000	
TOL.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	

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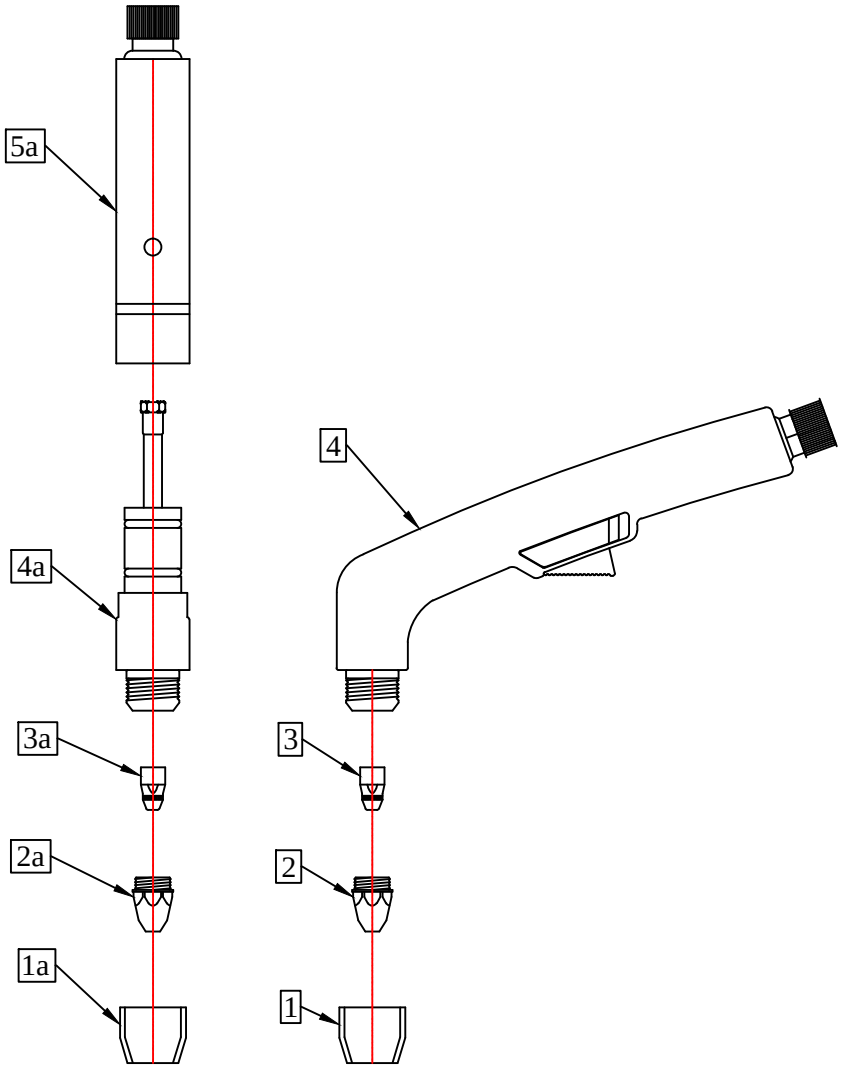
TITLE:- 90AMP PLASMA CUTTING TORCH

SUB TITLE:- A-90 FOR WAP-15 & 30 (AIR COOLED)

	NAME	DATE	SIGN	SCALE	SHEET OF
DRAWN	S.GHOGALE	21-05-2006		N.T.S	DRG. NO. WEPL/T0002 R
CHECKED & APPROVED	P.GOLLA	25-05-2006		PROJECTION:	



A) PLASMA MACHINE TORCH (AP-80P)

SR. NO.	DESCRIPTION	CODE NUMBERS
1a	NOZZLE RETAINING CUP	PC0068
2a	TIP	Ø1.5MM = PD0084P-15, Ø1.7MM = PD0084P-17
3a	ELECTRODE	PR0070
4a	TORCH HEAD	AP - 80P
5a	MACHINE HANDLE	

B) PLASMA HAND TORCH (TP - 80)

SR. NO.	DESCRIPTION	CODE NUMBERS
1	NOZZLE RETAINING CUP	PC0068
2	TIP	Ø1.5MM = PD0084P-15, Ø1.7MM = PD0084P-17
3	ELECTRODE	PR0070
4	TORCH HEAD	TP - 80

REV.NO	REVISION NOTE	DATE	SIGN.	CHECKED

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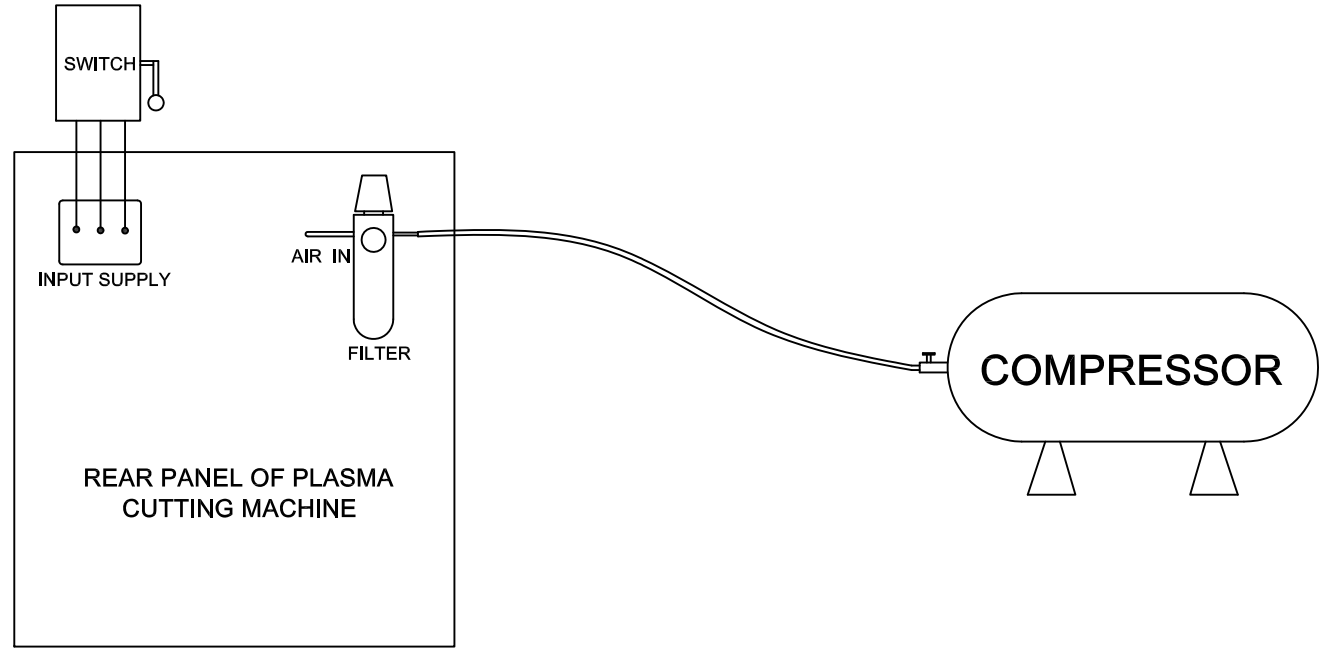
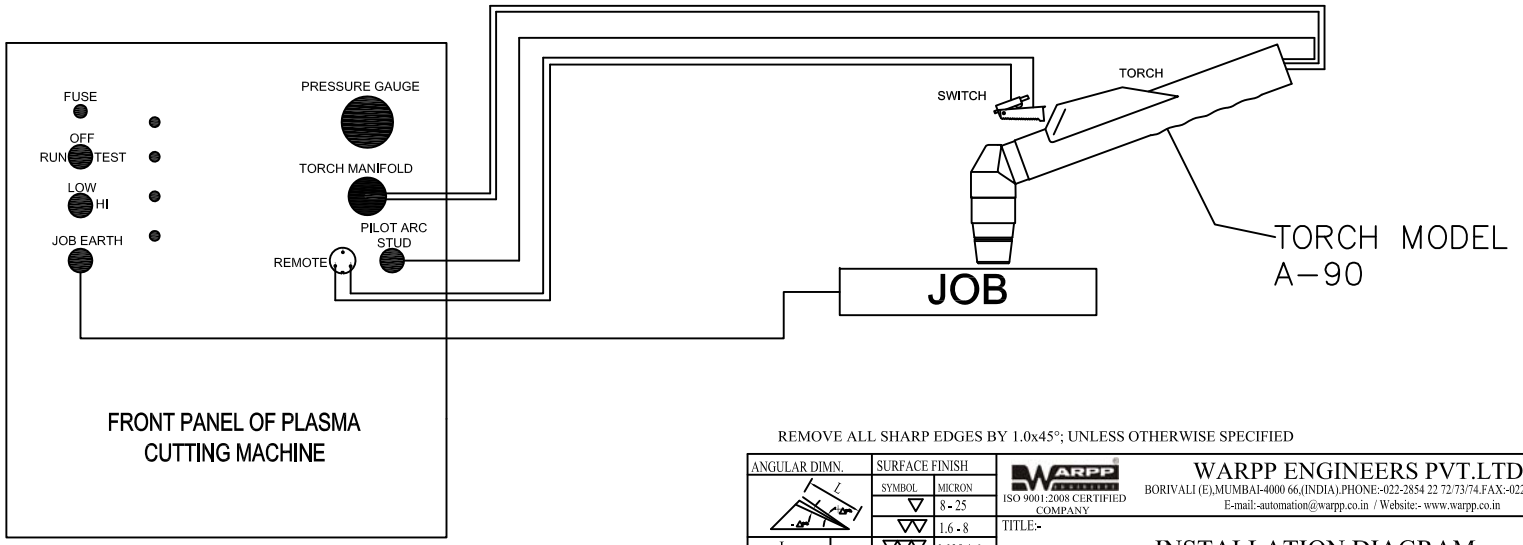
ALL DIMENSIONS IN mm				DRAWING NAME:- DETAILS OF TORCH PARTS		
LINEAR DIMNS.				TORCH MODEL:- TP-80 AND AP - 80P TORCH		
OVER	——	06	30	DRAWN BY / DATE	CHECKED BY / DATE	APPROVED BY / DATE
UPTO	06	30	1000	SHRUTIKA GHOGALE DATE:- 30-07-2014	RAMAKANTH BHAGAVATH DATE:- 01-08-2014	PRABHUDAS GOLLA DATE:- 03-08-2014
TOL.	±0.5	±0.75	±1.0			
DRAWING NO:- WEPL/DRG-13						
REV.NO:- 00				REMARK :-		

R.NO.	REVISIONS	R. DATE	R. BY	R. CHD.





REMOVE ALL SHARP EDGES BY 1.0x45°; UNLESS OTHERWISE SPECIFIED

ANGULAR DIMN.			SURFACE FINISH	
L		TOL.	SYMBOL	MICRON
OVER	UPTO			8 - 25
1	6	± 1°		1.6 - 8
6	30	± 30'		0.025-1.6
30	120	± 20'		< 0.025
120	400	± 10'	MACHINING TOL. OPEN DIMNS. AS PER IS:2102 1969. DIM.IN mm	

LINEAR DIMNS.						
OVER	—	6	30	120	315	
UPTO	6	30	120	315	1000	
TOL.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	

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TITLE:-

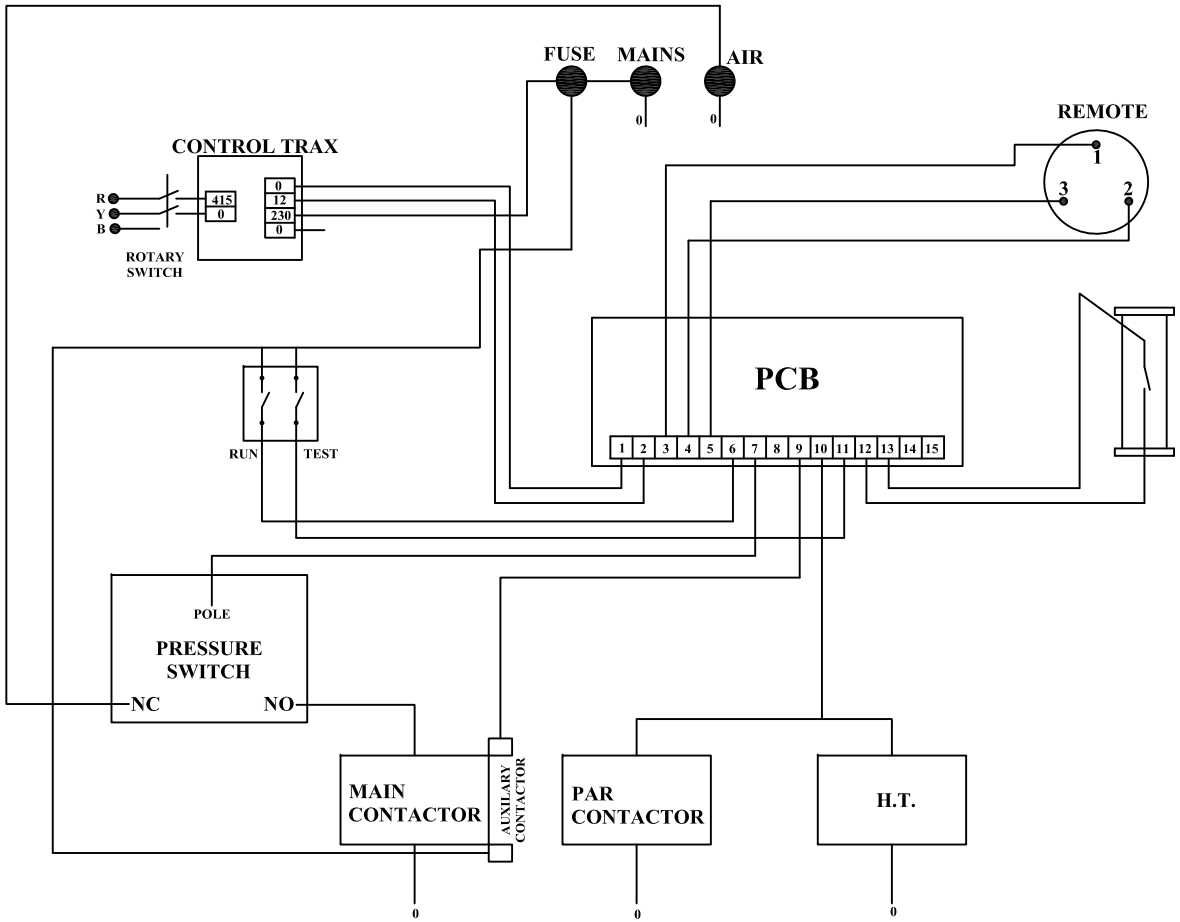
INSTALLATION DIAGRAM

SUB TITLE:-

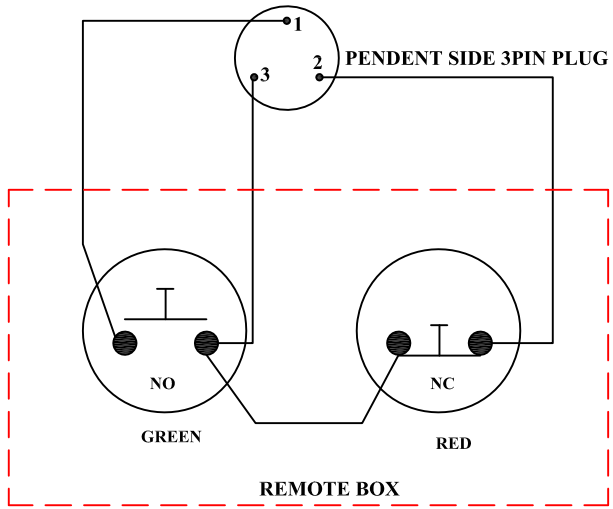
WAP-15 & 30

	NAME	DATE	SIGN	SCALE	SHEET OF
DRAWN	S.GHOGALE	21-05-2006		N.T.S	DRG. NO.
CHECKED & APPROVED	P.GOLLA	25-05-2006		PROJECTION:	WEPL/C0007 R

R.NO.	REVISIONS	R. DATE	R. BY	R. CHD.



REMOTE PENDENT FOR MACHINE TORCH



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ANGULAR DIMN.			SURFACE FINISH	
			SYMBOL	MICRON
				8 - 25
				1.6 - 8
L		TOL.		0.025-1.6
OVER	UPTO			< 0.025
1	6	± 1°	MACHINING TOL.	
6	30	± 30'	OPEN DIMNS. AS	
30	120	± 20'	PER IS:2102 1969.	
120	400	± 10'	DIM.IN mm	

LINEAR DIMNS.						
OVER	—	6	30	120	315	
UPTO	6	30	120	315	1000	
TOL.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	

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TITLE:- CONTROL WIRING DIAGRAM

SUB TITLE:- WAP-15 & 30

	NAME	DATE	SIGN	SCALE	SHEET OF
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CHECKED & APPROVED	P.GOLLA	25-05-2006		PROJECTION:	

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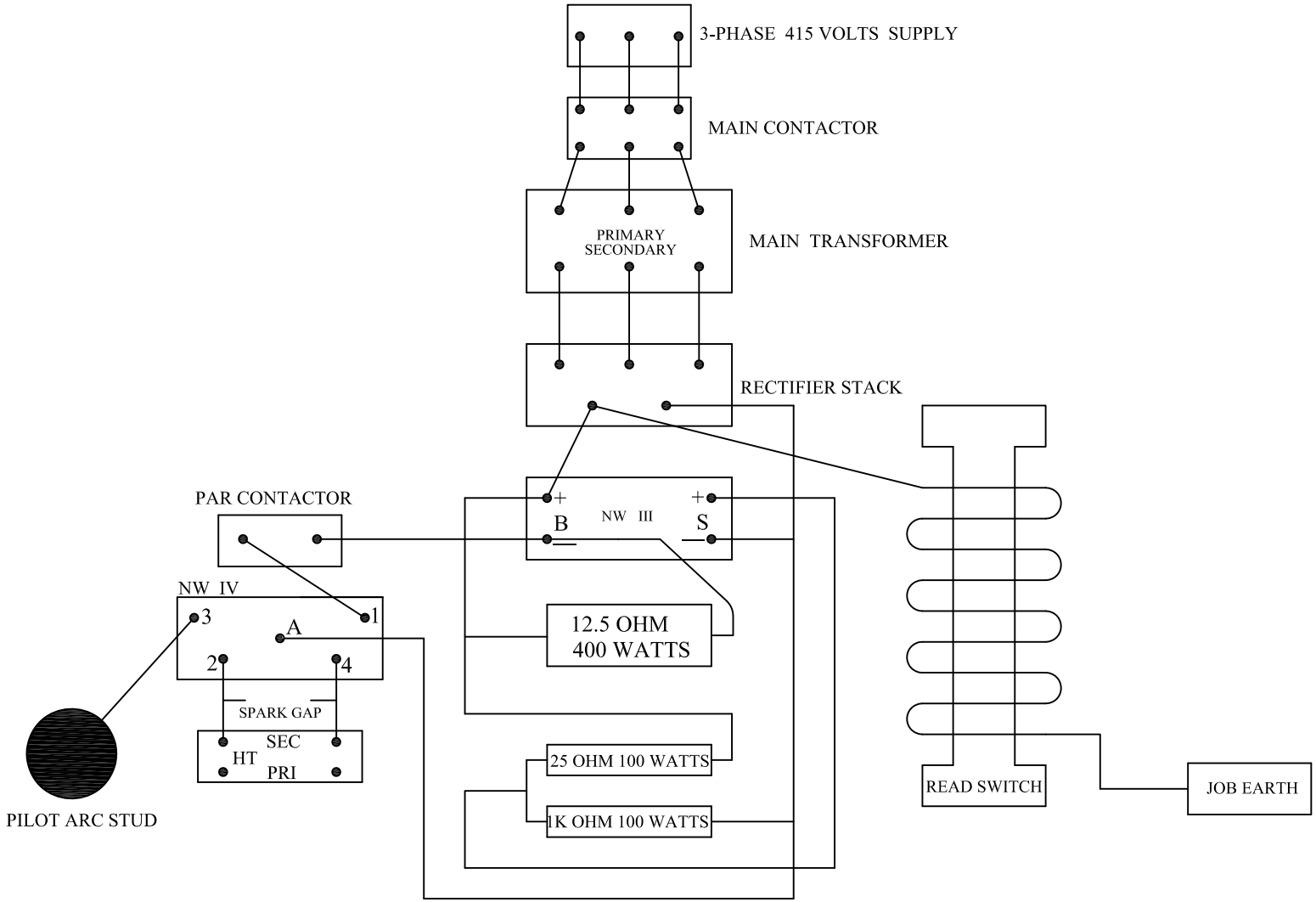

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ANGULAR DIMN.			SURFACE FINISH	
			SYMBOL	MICRON
			▽	8 - 25
			▽▽	1.6 - 8
L		TOL.	▽▽▽	0.025-1.6
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TITLE:- DC WIRING DIAGRAM

SUB TITLE:- WAP-15 & 30

	NAME	DATE	SIGN	SCALE	SHEET OF
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CHECKED & APPROVED	P.GOLLA	25-05-2006		PROJECTION:	WEPL/C0007 R

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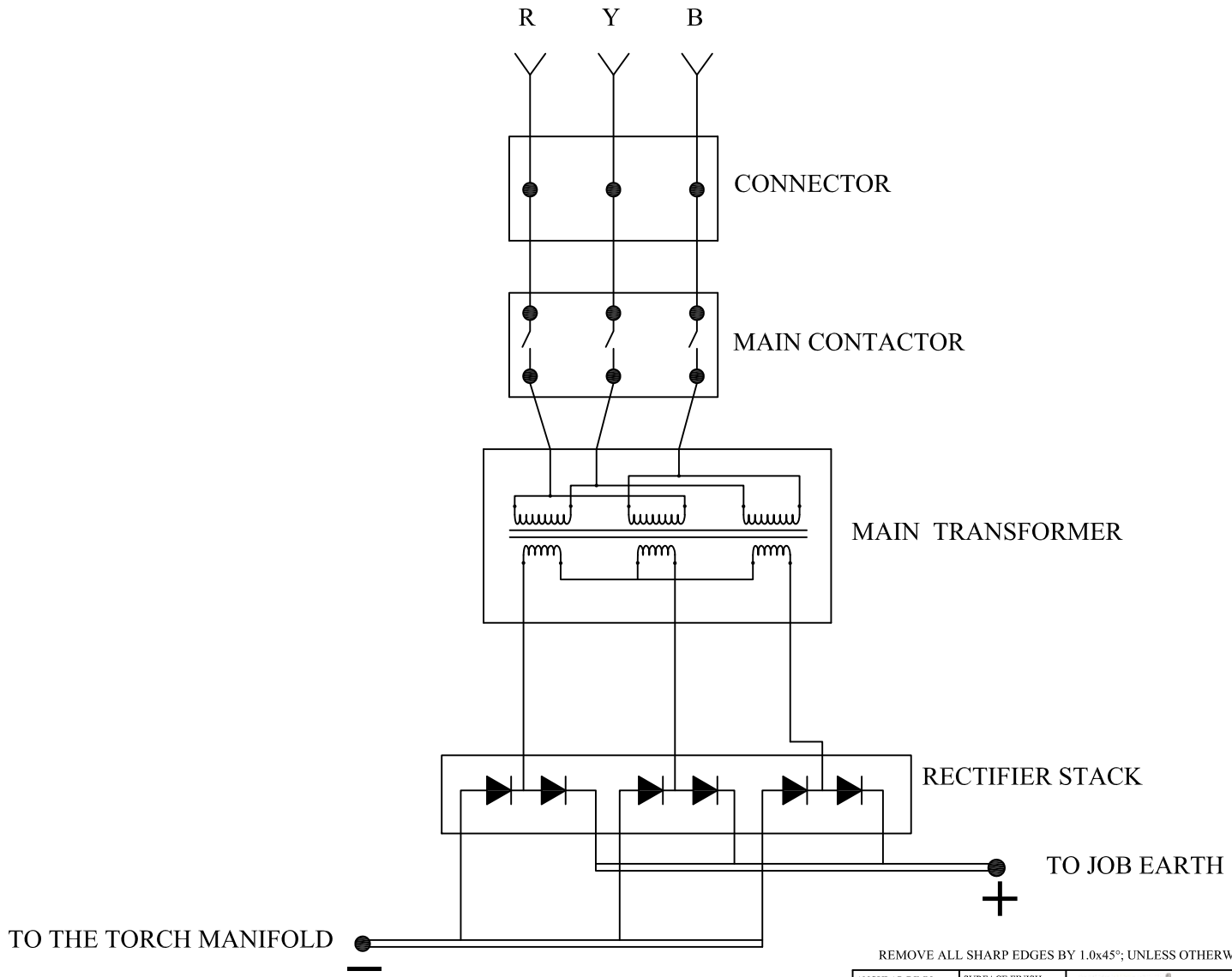

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L		TOL.	SYMBOL	MICRON
OVER	UPTO		▽	8 - 25
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120	400	± 10'	MACHINING TOL.	
			OPEN DIMNS. AS	
			PER IS:2102 1969.	
			DIM.IN mm	

LINEAR DIMNS.						
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TITLE:-

POWER CIRCUIT WIRING DIAGRAM

SUB TITLE:- PLASMA 15 & 30

	NAME	DATE	SIGN	SCALE	SHEET OF
DRAWN	S.GHOGALE	21-05-2006		N.T.S	DRG. NO.
CHECKED & APPROVED	P.GOLLA	25-05-2006		PROJECTION:	WEPL/C0007 R