PRO SPOT

QUALITY WELDING SYSTEMS

DRAWN ARC PS-DA5

Instruction Manual

MNL-PS-DA5-v1.0

About Pro Spot

Pro Spot International, Inc., based in Carlsbad, California, manufactures resistance spot welding equipment specializing in applications for the collision repair industry. The company began in 1986. The company owns and manages an on site machine shop, research & development department, a fabrication facility and production lines for the various welders

Pro Spot International exports its products worldwide, export sales are managed through our headquarter office. The company owns numerous patents for our ingenious application tools, machines, and procedures.

Pro Spot training and services

Pro Spot Distributors and Sub-Distributors are carefully selected and are well trained in the collision repair industry. We offer technical and service education at our world wide training facilities at regular intervals so your local distributor will always be up to date and able to pass on the latest in spot welding technology to our customers.

Customer service is an important part of any investment and our distributors and sub-distributors will be there to support your technical and service needs. We have a great customer service record, we tend to keep it that way.

ASE Continuing Automotive Service Education
CERTIFIED TRAINING PROVIDER

I-CAR® | INDUSTRY TRAINING ALLIANCE™

Pro Spot is certified by CASE and a member of the I-CAR Industry Training Alliance

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1.0 Safety

1.1 Work Environment

WARNING! Do not operate or place the PS-DA5 near water, in wet locations or outdoors. Risk for injuries or damage to the PS-DA5.

WARNING! Do not place the PS-DA5 on unstable or uneven surface. The PS-DA5 might fall causing personal injuries or damage to the PS-DA5.

- Keep the work place clean and free of debris to prevent accidents.
- Keep this device away from children and unauthorized or untrained personnel.
- Store this device in a clean environment. Keep away from high temperatures, corrosive liquids and gases that could damage the equipment.
- Never use or charge this device in an environment with flammable and explosive liquid, gas or dust.

1.2 Electrical Safety

WARNING! All electrical connections must be made by a qualified electrician. Risk for electrical shock.

- Always match the PS-DA5 plug with the wall socket. Never modify the plug.
- The PS-DA5 and all of its components should never be exposed to wet or extremely humid environments. Exposing any part of the electrical system to water will increase the risk of electrical shock.
- Always unplug the PS-DA5 during a lightning storm.

1.3 Personal Safety

WARNING! Make sure to use safety goggles when using the PS-DA5.

WARNING! The PS-DA5 may only be used by qualified personnel. The user of the Drawn Arc must have knowledge of stud welding.

- Keep focused and alert while operating the device. Never use it when you are tired or under the influence of medication or alcohol.
- Wear slip-proof gloves and tinted glasses while operating the device.
- Serious injury may occur.

IMPORTANT: BEFORE STARTING THE EQUIPMENT, READ THE CONTENTS OF THIS MANUAL, WHICH MUST BE STORED IN A PLACE FAMILIAR TO ALL USERS FOR THE ENTIRE OPERATIVE LIFE-SPAN OF THE MACHINE. THIS EQUIPMENT MUST BE USED SOLELY FOR WELDING OPERATIONS.

SAFETY PRECAUTIONS

WELDING AND ARC CUTTING CAN BE HARMFUL TO YOURSELF AND OTHERS. The user must therefore be educated against the hazards, summarized below, deriving from welding operations.

ELECTRIC SHOCK - May be fatal.
Install and ground the welding machine according to the applicable regulations.
Do not touch live electrical parts or electrodes with bare skin, gloves or wet clothing.
Isolate yourselves from both the earth and the work piece.
Make sure your working position is safe.

FUMES AND GASES - May be hazardous to your health.
Keep your head away from fumes.
Work in the presence of adequate ventilation, and use ventilators around the arc to prevent gases from forming in the work area.

ARC RAYS - May injure the eyes and burn the skin.
Protect your eyes with welding masks fitted with filtered lenses, and protect your body with appropriate safety garments.
Protect others by installing adequate shields or curtains.

RISK OF FIRE AND BURNS
Sparks (sprays) may cause fires and burn the skin; you should therefore make sure there are no flammable materials in the area, and wear appropriate protective garments.

NOISE
This machine does not directly produce noise exceeding 80dB. The plasma cutting/welding procedure may produce noise levels beyond said limit; users must therefore implement all precautions required by law.

PACEMAKERS
The magnetic fields created by high currents may affect the operation of pacemakers. Wearers of vital electronic equipment (pacemakers) should consult their physician before beginning any arc welding, cutting, gouging or spot welding operations.

EXPLOSIONS
Do not weld in the vicinity of containers under pressure, or in the presence of explosive dust, gases or fumes. All cylinders and pressure regulators used in welding operations should be handled with care.

ELECTROMAGNETIC COMPATIBILITY
This machine is manufactured in compliance with the instructions contained in the harmonized standard，and must be used solely for professional purposes in an industrial environment.
There may be potential difficulties in ensuring electromagnetic compatibility in non-industrial environments.

IN CASE OF MALFUNCTIONS, REQUEST ASSISTANCE FROM QUALIFIED PERSONNEL.

2.0 GENERAL TECHNICAL DESCRIPTIONS

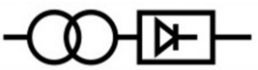
2.1 SPECIFICATIONS

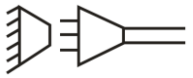
This manual has been prepared with the intent of instructing the operator on how to install, operate, and properly maintain this electric arc welding machine.
This machine is a constant current power source for MMA welding.
Upon receiving and unpacking the machine, make a careful inspection to ensure that there are no damaged parts.
Should there be a claim for losses or damages it must be made by the purchaser directly to the shipping company delivered the equiptment.
When requesting information about this welding machine please state the machine's part number and serial number to ensure receiving accurate information relating to your machine.

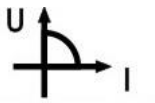
2.2 DESCRIPTION OF TECHNICAL SPECIFICATIONS

MODEL: The model of the machine PS-DA5
EN 60974-10:2003 International Standards.
SN Machine Serial Number which must appear on requests or inquiries concerning the machine.

Rectifier to DC/AC


Single-phase transformer to rectifier


Three-phase input



Voltage current characteristic

50/60Hz Input supply at 50 or 60Hz.
Uo Secondary no-load voltage (peak value).
X Duty-Cycle Percentage
The duty-cycle is the number of minutes, expressed as a percentage, the machine can operate (arc on) within a ten minute period without overheating. The duty cycle varies according to the output current.
I2 Output welding current
I1 Input Amps absorbed corresponding to different output levels (**I2**).
U2 Secondary voltage with welding current **I2.**
U1 Nominal supply voltage
IP21. Protection class of the machine's case. The 1 in the second digit place means that this unit is not fit to work outdoors in the rain.
S1 Power of the machine
Power Factor Actual power/nominal power

3.0 INSTALLATION

3.1 SETUP

Place the machine in a ventilated area.
Dust, dirt, or any other foreign material that might enter the machine may restrict the ventilation which could affect the machine's performance.

3.2 INPUT POWER CONNECTIONS

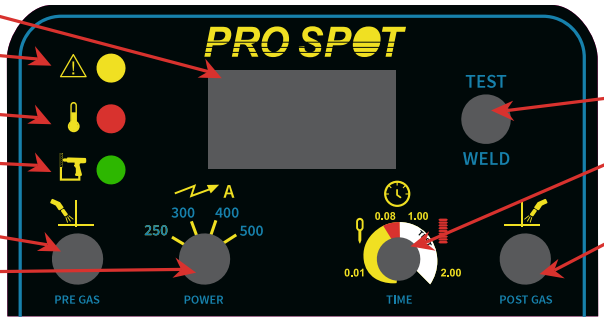
All sections concerning the installation of this machine must be read carefully.
This machine must be installed by authorized personnel.
Make sure that the input power plug has been removed from the power source before inspecting, maintaining, or servicing.
Connect the green wire with a yellow stripe wire to a good electrical ground.
Do not use water pipes as earth conductor.
After a final inspection, the machine should be connected to the input supply voltage marked on the input power cord.

Power Requirements:

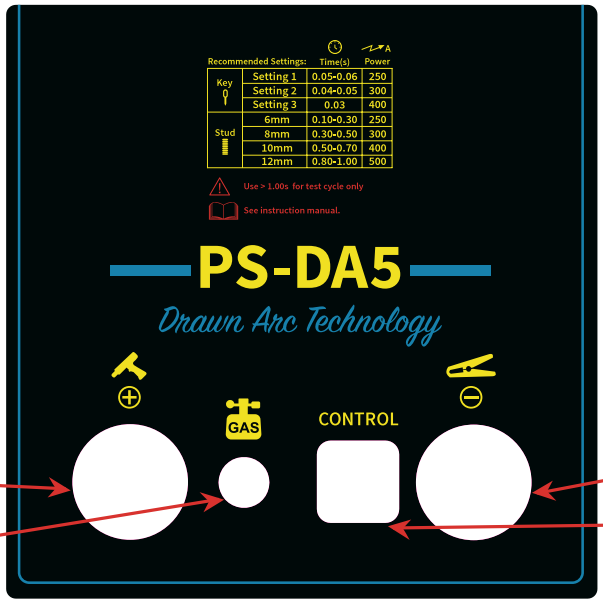
✓ 208-240V 50/60 Hz U.S.A., Canada, Japan *OR*
✓ 400-420V 50/60 Hz Europe, Australia

3.3 DESCRIPTION OF CONTROLS

A. Display
B. Warning
C. Over Heat Indicator
D. Short Circuit Indicator
F. Pre Gas
H. Welding Current



E. Weld / Test switch
G. Weld Time Adjustment Knob
I. Post Gas Adjustment Knob



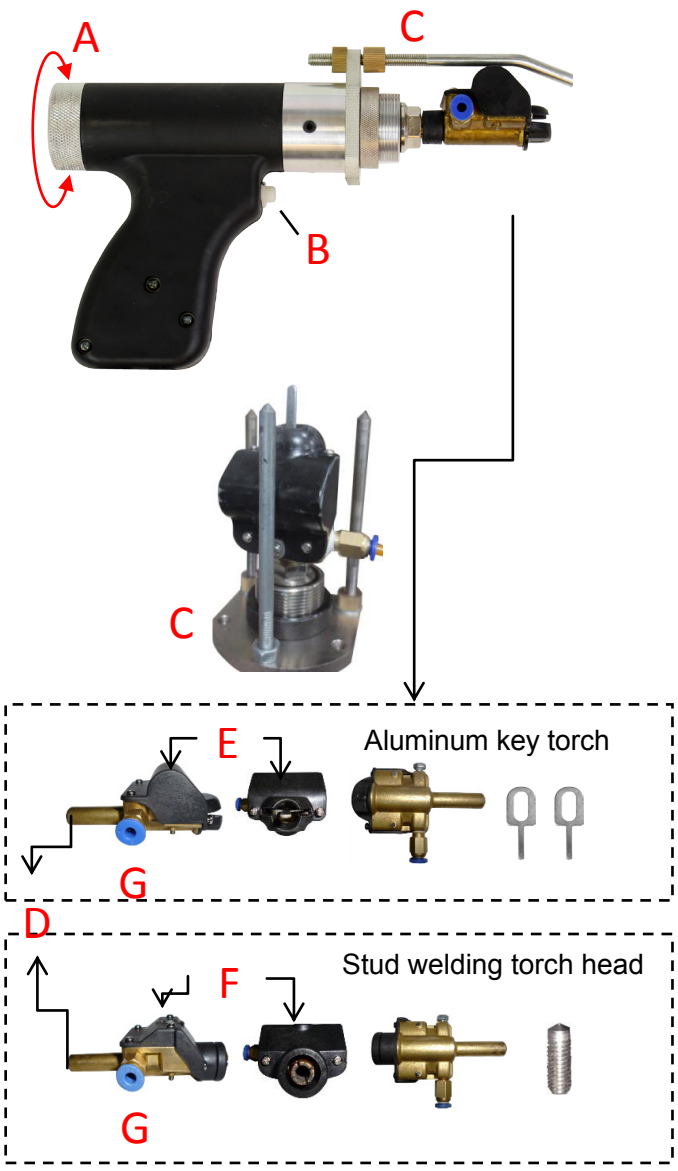
J. + Output Terminal
(Positive Outlet)
L. Gas

K. Control
M. - Output Terminal
(Negative Outlet)

r	Function	Description
a	Meter	Display: (1)Welding time: 0.01～2.00 sec。 (2)Welding current: PS-DA500 = 250/300/400/500 A (3)Error code:E01~E08。 (4)Test mode:"tSt"。
b	Warning indicator	When the machine is abnormal, the warning indicator will light up. Please check the machine problem, refer to the error code E01-E08. E01: Torch trigger is on, before turning on the machine. E02: Output terminals are short circuit, before turning on the machine. E03: The machine is in overheat protection. E04: Input power voltage is too low. E05: Input power voltage is too high. E06: Output terminals ("+" "-") are not connected, use the trigger on the torch, when stud welding. E07: Current control is abnormal.(for 500A type machine) E08: Current control is abnormal.(for 800A type machine)
c	Over heat indicator	When the machine is over heated, the indicator will be lit. The indicator is controlled by thermal switch. Thermal switch is normal close type. It is mounted on IGBT cooling fin and connected to main control PCB J4.
d	Short circuit indicator	When the output terminals are short circuited, the indicator will be lit. When the output terminals are open circuited, it will be 8V-10VDC voltage.
e	Test/Welding selection	Test mode: The meter display"tSt", the user can try to use torch for test arc stud welding operation(simulation), but does not output welding current. Welding mode: The meter display welding current and welding time. The machine output welding current.
f	Gas pre-flow	Gas pre-flow time range is 0.05 sec ~ 1 sec, clockwise increase.
g	Welding time	Welding time range is 0.01 sec ~ 2.00 sec, clockwise increase. In welding mode, when changing welding time, the meter will display welding time value for 3 sec. After 3 sec, the meter will change to display welding current value.
h	Welding current	There are 4 steps welding current setting. PS-DA500 = 250/300/400/500 A, PS-DA500 = 250/400/600/800 A
i	Gas post-flow	Gas post-flow time range is 0.1sec ~ 0.5 sec，clockwise increase.
j	Output terminal +	Connect to earth clamp.
k	Torch control connector	There are 4 pins for the connector. Two pins for control torch trigger. Two pins for control torch solenoid. Please refer to the attached drawing.
l	Gas connector	Connector to gas.
m	Output terminal -	Connect to torch

4.0 DESCRIPTION OF PS-DA5 WELDING TORCH

Item	Function	Description
A	Adjust electrode pulled distance. (washer or stud)	Clockwise rotation--- reduce the distance. Counter clockwise rotation---increase the distance. Refer to the red area is showing the distance. Note: Too long pulled distance may lead to the solenoid to not work normally.
B	Torch trigger	In welding mode, trigger on the torch, start to weld. Note: Do not weld two times on the same work piece. In test mode, press trigger start to test arc welding operation.
C	Auxiliary support	The auxiliary support has 3 legs and 5 mounting holes. The user can choose suitable legs and mounting holes according to welding situation.
D	Welding electrode	The electrode can be used with different covers and accessories, compose aluminum washer torch head, and arc stud welding torch head.
E	Cover for aluminum washer	
F	Cover for stud	
G	Gas connector	Make sure the gas hose is inserted to the end, when connected to the gas hose. Please press the blue gas connector to the end, before removing the gas hose.



Aluminum Washer Welding Instruction V2.1

Welding parameter：

(a) Welding Current：250A.

(b) Welding Time：0.05~0.07sec. (According to car body material)

(c) Washer Extension：1~2mm..

(d) Lifting length/Arc length (effect welding voltage)：2~3mm.

(e) If the welding result is too strong, connect the torch with “+”, connect the earth with “-”.

5.0 SUGGESTED WELDING PARAMETER

The following parameters are for reference only, subject to the actual welding situation.

Aluminum Key welding

Key extension, key pulled distance, welding current, and welding time are main parameters for aluminum key welding.
Adjustment suggestions as follows:
1) Gas flow: 6～7 L/min (pre-flow time and post-flow time are not major factors).
2) Key extension: Insert the washer to the end, and then adjust support leg.
Make sure the distance between the tip of key and the support legs are about 2-3mm
3) Key pulled distance: Choose test mode, adjust welding time to longest. Press the torch head with washer on the horizontal plane. Trigger on torch, and then measure the washer pulled distance. The back cover of the torch is for adjusting the distance. Clockwise rotation reduce the distance.
Counter clockwise rotation increase the distance. Note: The extension is about 2-3mm, too long of a distance may damage the key.

Suggestion 1.
Welding current：250A。
Welding time：0.05 or 0.06sec。
Suggestion 2.
Welding current：300A。
Welding time：0.04 or 0.05 sec。
Suggestion 3.
Welding current：400A。
Welding time：0.03 sec。

PS-DA5 welding

1) Stud extension: about 1-2mm, should be more than welding length. If extension length is not enough, the stud cannot reach the bottom of weld crater, and lead to poor welding quality.
2) Stud pulled distance: about 2-2.5mm.

Welding time and current:

Stud diameter (mm)	Welding time (s)	Welding current (A)	Gas flow (L/min)	Minimum thickness for work piece	
				Steel	Aluminum
4.0~6.0	0.1~0.3	250	6.5~7.0	1.3	3.3
8.0	0.3~0.5	300	6.5~7.0	1.5	4.8
10.0	0.5~0.7	400	8.5~9.0	2.0	4.8
12.0	0.8~1.0	500	8.5~9.0	3.0	6.4

Check the welding result. If the power is too low or too high, please try to adjust one parameter at a time. For example: fix the welding current and adjust welding time.
Adjust welding current and time, according to thickness for work piece. For example: welding 6mm aluminum stud to 1.2mm thickness aluminum sheet, if setting on the welding current is 300A,the welding time is about 0.08 - 0.09 sec.

Torch & ground cable connection:

(Recommended)

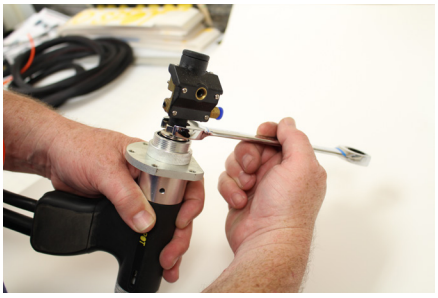
	Torch + / Ground -	Torch - / Ground +
Tension Strength	✓	
Easy-to-use	✓	
Surface clean		✓
Allowable deflection Angle	25°	15°
User	Starter	Professional

1. Install Support Leg Adapter

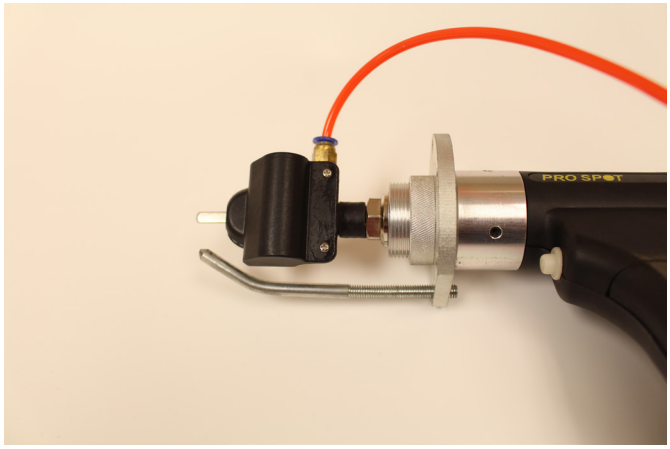
1. Install leg adapter on the gun.
2. Hand tighten knurled nut to secure the leg adapter.

2. Installing Key Torch Head

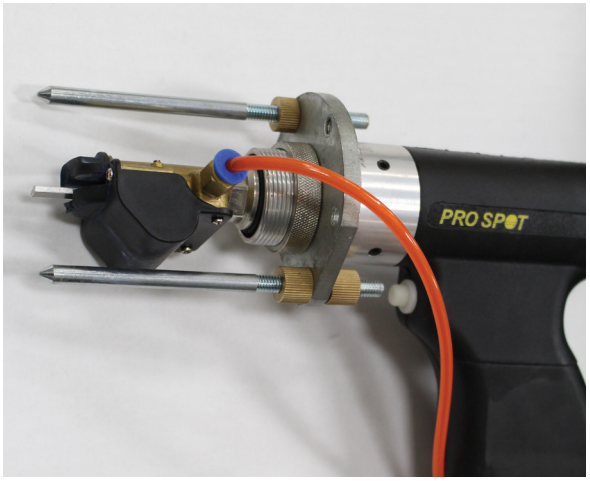
1. Insert torch head into the gun.
2. Tighten the retaining nut with the appropriate size wrench.
3. Make sure torch head does not touch any of the support legs.
4. Install gas line in the fitting by pushing it into the fitting.



3. Support Leg Installation - Single Leg.



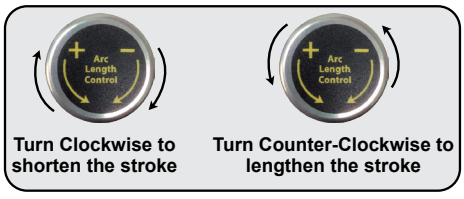
4. Support Leg Installation - Dual Leg.



5. Setting Lifting Height of the Torch Head

1. Push the torch head into the gun to verify 2-3mm of inward movement.
2. Use the dial on the back of the gun to adjust lifting height.

6. Adjusting Lifting Height of the Torch Head

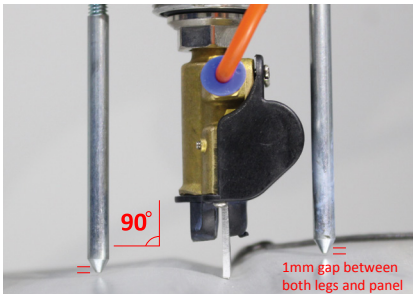


- Turn Clockwise to lessen the amount of stroke (if torch moves into the gun more than 2-3mm)
- Turn Counter-Clockwise to increase the amount of stroke (If torch moves into the gun less than 2-3mm)

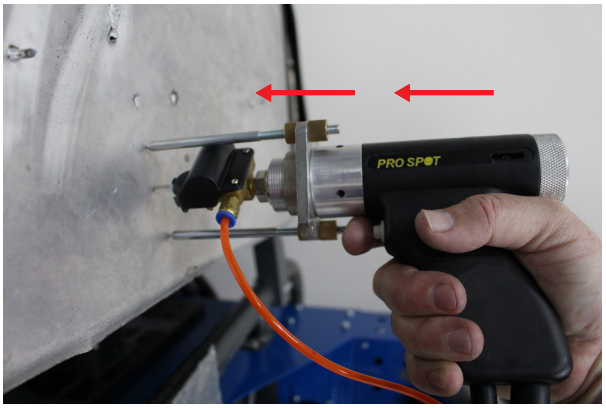
Note: When welding to thin panels, less stroke is better and helps prevent the key from pushing through the panel when it is being welded to the surface.

7. Support Leg Height (Single Leg or Dual Leg):

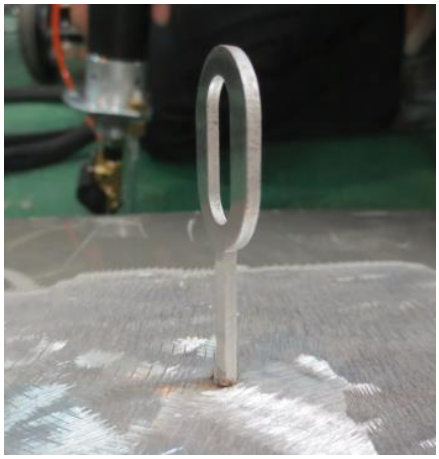
1. Insert weld key into the torch head.
2. Place the tip of the weld key in location to be welded.
3. Adjust support leg(s) to 1mm away from panel WITHOUT putting downward pressure on the gun. Make sure the key is welded 90° to the panel for maximum pulling strength.



8. Use a stainless steel brush to clean surface just before welding. Push gun down so the support legs touch the panel. Push the trigger button to attach the weld key.



9. After welding, wait a minimum of 0.5 seconds, then pull the torch off the welded key.

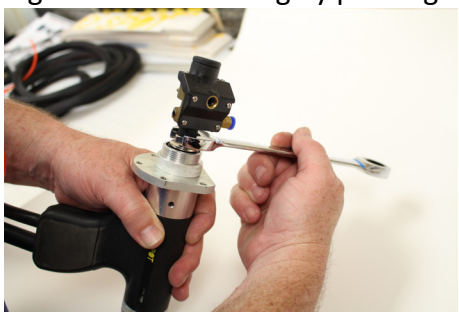


Note:

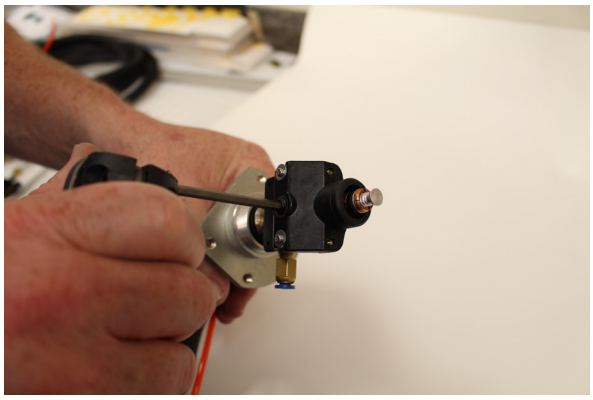
Re-using welding Keys:
The weld on keys can be re-used. When cutting/ re-shaping the keys, it is good practice to make them all the same length. This makes set up of the welding much easier. When welding on keys that have been modified, it is important to start at step 5 to get the proper weld.

1. Install Support Leg Adapter
1. Install leg adapter on the gun.
2. Hand tighten knurled nut to secure the leg adapter.

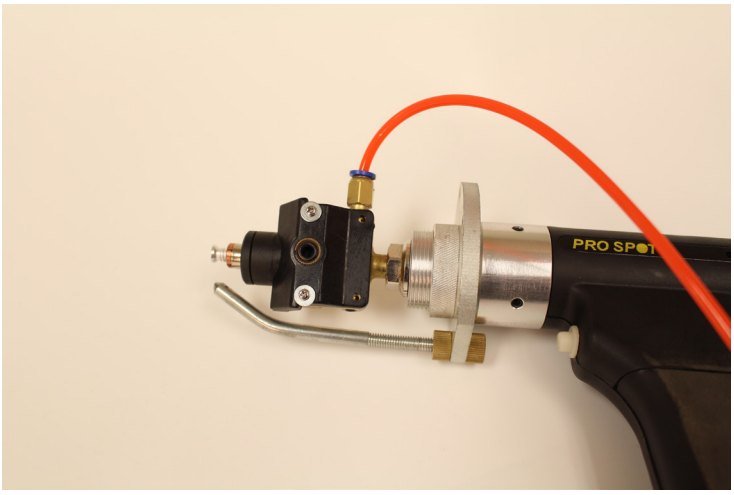
2. Installing Stud Torch Head
1. Insert stud torch head into the gun.
2. Tighten the retaining nut with the appropriate size wrench.
3. Make sure torch head does not touch any of the support legs.
4. Install gas line in the fitting by pushing it into the fitting.



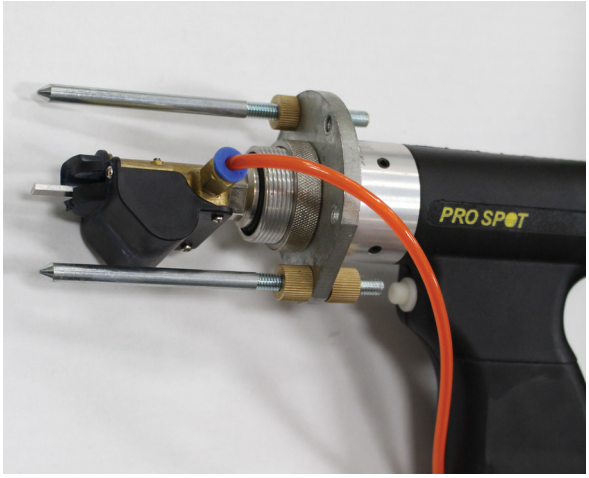
3. Installing Stud Chuck into Torch Head
1. Choose the appropriate size chuck for the stud been used.
2. Insert chuck into the torch head.
3. Tighten the chuck in the torch head.



4. Support Leg Installation - Single Leg.

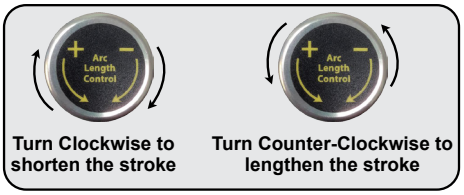


5. Support Leg Installation - Dual Leg.



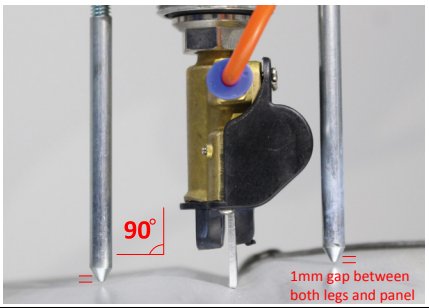
6. Setting Lifting Height of the Torch Head
1. Push the torch head into the gun to verify 2-3mm of inward movement.
2. Use the dial on the back of the gun to adjust lifting height.

7. Adjusting Lifting Height of the Torch Head

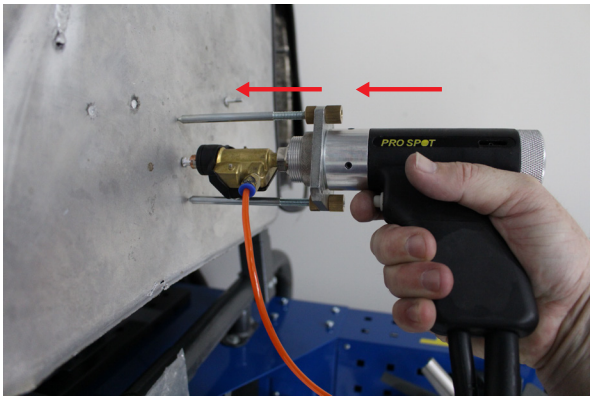


• Turn Clockwise to lessen the amount of stroke (if torch moves into the gun more than 2-3mm)
• Turn Counter-Clockwise to increase the amount of stroke (If torch moves into the gun less than 2-3mm)
Note: When welding to thin panels, less stroke is better and helps prevent the key from pushing through the panel when it is being welded to the surface.

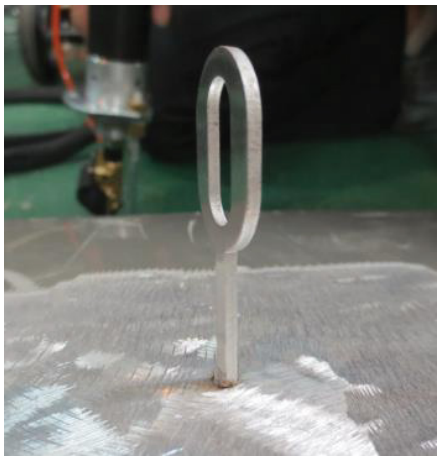
8. Support Leg Height:
1. Insert stud into the torch head.
2. Place the stud in location to be welded.
3. Adjust support legs to 1mm away from panel putting downward pressure on the gun. Make sure the stud is weled 90° to the panel for maximum strength.



9. Use a stainless steel brush to clean surface just before welding. Push gun down so the support legs touch the panel. Push the trigger button to attach the weld key.



10. After welding wait a minimum of 0.5 seconds, then pull the torch off the welded key.



6.0 TROUBLESHOOTING

Code	Cause AL panel repair (380V)	Remedy
E01	Torch trigger is on, before turning on the machine.	Don't trigger on, before turning on the machine.
E02	Output terminals are short circuit, before turning on the machine.	Don't short circuit the output terminals, before turning on the machine.
E03	The machine is over heat protection. The machine is over duty, over heated. Or the thermal switch failed.	Check the machine. If the machine is over heated, wait while the machine is cooling, it can work again. If the machine is not over heat, please check the thermal switch. Thermal switch is normal close type. It is mounting on IGBT cooling fin and connection to main control PCB J4
E04	Input power voltage is too low. When input power voltage is low than 185V,it will display E04.	Check the input voltage. Standard voltage is 185V. Adjusting R3 of the control PCB can change standard voltage. Adjusting high resistance of R3 will increase standard voltage.
E05	Input power voltage is too high. When input power voltage is high than 255V, it will display E05.	Check the input voltage. Standard voltage is 255V. Adjust R3 of the control PCB can change standard voltage. Adjust low resistance of R3 will reduce standard voltage.
E06	Output terminals ("+" "-") are not connected, use the trigger on the torch, when stud welding. It will display E06	The torch and work piece should have a good connection, before welding.
E07	Current control is abnormal. (for 500A type machine)	Test the voltage between TP1 and GND of main control PCB. Normal situation: follow "diagram 1".
E08	Current control is abnormal. (for 800A type machine)	Test the voltage between TP1 and GND of main control PCB. Normal situation: follow "diagram 1".

DIAGRAM 1

PS-DA5	PS-DA5
Vref -> Iout 7.14V -> 488A 5.88V -> 400A 4.40V -> 300A 3.67V -> 250A	Vref -> Iout 11.54V -> 800A 8.8V -> 600A 5.88V -> 400A 3.67V -> 250A

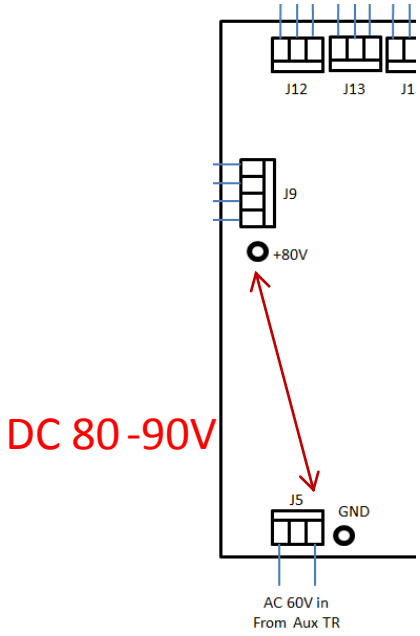
Q1: Welding torch cannot work

A1:

Remove torch head, setting the pulled distance to lowest.
Use test mode to test the torch.

In the test mode the torch can work, but cannot weld. Please check torch cable and earth cable connection.
If it is not a good connection, the meter will show error code E06.

(The following test needs to be perfomed by the professional)
In test mode use multimeter DC mode, test +80V test point (near by J9 of Main board) to GND test point.
When torch trigger is on the output is DC 80-90V.
This is torch power. If no output, the main board is damaged.
If the torch power is normal, the main board is normal .
Please check the torch. The torch may be damaged.



Q2:Welding torch cannot work, but no output current

A2:
Use multimeter test output terminal,it is 8-10V DC(OCV).
If no output, the circuit for J6(on main board) to output terminal has failed.
(The following test needs to be performed professional)
Remove J6(on main board). Short the short circuit detection circuit. Select welding mode. Set current at 250A. Use multimeter test output terminal. Trigger on torch, and output OCV 67-75V DC.
If the machine cannot output normally, it may be caused by the following:
1.Driver board failed.
2.IGBT failed.
3.Primary rectifier failed.
4.Secondary rectifier failed.
If the machine can output OCV 67-75V DC.
Please check the current setting.
Setting current should be according the voltage of J2(Vref).z
(May test voltage between TP1 to GND)
PS-DA5: 250A/3.7V、300A/4.4V、400A/5.9V、500A/7.1V
PS-DA5: 250A/3.7V、400A/5.9V、600A/8.8V、800A/ 11.5V

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