



AC Welder

Users Guide

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sunstone[™]
The Micro Welder Experts



ATTENTION: Read the Safety Guide before operating this welder!
Operator assumes all liability.



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FORWARD

Thank you for choosing Sunstone Welders and congratulations on your purchase!

You are now the proud owner of a an AC Welding System. This guide was designed to have you welding safely within minutes of unpacking your new welder. Please read and follow all safety precautions before proceeding with the welding process.

At Sunstone Engineering we are committed to producing quality products and ensuring complete owner satisfaction. If you require assistance after reading this guide please contact us with the information provided below.

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NOTE: The information contained in this guide is subject to change as improvements are made to our products. Visit www.SunstoneWelders.com for the latest version of this document.

INTRODUCTION

Sunstone Engineering offers 2.2kVA, 5.0kVA, and 15.0kVA AC welders. These units can be very effective for a large variety of applications. All models are capable of performing single spots, roll-spots, or true seam welds. The 2.2kVA is designed for lower powered welds, where part thicknesses are not too thick. The 5.0kVA and the 15kVA models have additional power capabilities to give additional refinement and control for pieces that are much thicker.

WELDER SETUP

VOLTAGE AND POWER REQUIREMENTS

Ensure that you have the proper electrical wiring requirements for the welder. The 2.2kVA and 5.0kVA come wired for 240VAC and 15.0kVA comes wired for 415VAC.

SETTING UP THE WELDER

Setting up the AC welder is a quick and simple process. Take care and follow the step-by-step instructions to avoid injury and harm to yourself and to the equipment.

1. Unbox the contents
2. Connect the Positive and Negative leads of your hand-held attachment to their matching ports on the side of the welder.
 - The 2.2kVA has two 10mm silver plated Multilam secondary sockets
 - The 5.0kVA and 15kVA have a 16mm terminal for the hand attachment, and an 18mm terminal for the grounding clip. Ensure that the leads are connected to the appropriate terminals.
3. Connect the foot pedal or trigger switch to the welder.
4. Ensure that you have the proper electrical wiring requirements for the welder.
 - The 2.2kVA comes wired for 240VAC.
 - The 5.0kVA comes wired for 240VAC.
 - The 15kVA comes wired for 415VAC.
5. Plug-in the welder.

WELDER INTERFACE

1. **POWER ON** – The power on will light up anytime the welder is plugged-in to an appropriate VAC source.
2. **WELD GO** – The weld go will light up anytime the weld trigger is active and the unit is welding.
3. **SINGLE/REPEAT** – This controls the mode of operation for the welder. Selecting single will result in one weld per trigger actuation. Repeat will allow the welder to make multiple welds, as long as the trigger is engaged (foot pedal is depressed).
4. **WELD ON/WELD OFF** – Selecting weld off will disable the welder from performing welds.
5. **WELD CYCLES** – This switch gives the ability to use the normal weld cycles or to cut the cycles in half. The cycles are set using the cycle knobs on the bottom of the front panel. Using a half cycle gives additional refinement when setting up the weld.
6. **REST** – This knob controls the rest time between pulses. Setting the knob to “0” will set the machine in Seam Mode.
7. **WELD** – This knob controls the weld cycles, or how long the energy is released.
8. **POWER** – This knob controls the power as a percentage of total power, ranging from 40% - 100%.
9. **POWER RANGE** – This is available on the 5.0kVA model. The 5.0kVA model has 4 power ranges to choose from. Power range 1 is for lower powered welds; power range 4 is for higher powered welds.



WELDING ATTACHMENTS

WELDING ATTACHMENT OPTIONS

In order to create welds, a weld head or hand-held attachment is needed to deliver the weld energy to the weld spot. There are several different types of weld heads and hand-held attachments to choose from. Selecting the best option will depend on the production rates involved, part access and geometries, and available budgets. We offer a large selection of weld heads and hand attachments to choose from (See BELOW). Contact Sunstone Engineering to further discuss these options.

WELD HEAD ATTACHMENTS:

- Parallel
- Opposed

HAND-HELD ATTACHMENTS:

- Single Probe
- Dual Probe
- Tweezers

PG2 PISTOL GRIP:

- Micro-switch controlled
- 300 grams weight
- 10mm diameter with 3/8" thread.

PG2 PISTOL GRIP WITH ROLL-SPOT:

- Same specs as PG2 Pistol Grip
- Includes Copper Wheel and attachment

PG3 MEDIUM DUTY:

- Micro-switch controlled
- 450 grams
- 1/2" taper electrode

PG5 – TWEEZER HAND PIECE:

- Micro-switch controlled
- Ergonomically designed pliers

PG6 HEAVY DUTY:

- Pressure actuated
- Cast aluminum body with adjustable spring-loaded action
- 1/2" electrode tips, water cooled
- For use with higher-powered AC welders (5kVA, 15kVA).

METHOD OF OPERATION

EXAMPLE PROJECT SETUP #1

1. Plug in welder and ensure the 'Power On' LED is illuminated.
2. To use the PG2 hand attachment, push the copper jack plug into the left of the two sockets on the right side of the welder, and the switch jack plug into the corresponding socket. Push the copper jack plug on the ground clip into the other socket.
3. When using the PG2 hand attachment, set the 'Single/Repeat' toggle switch to 'Single'.
4. For sheet of .1mm, set 'Rest' time at 5 cycles, 'Weld' time at 4 cycles and 'Power' at 50%.
5. Attach ground clip to the work piece as near to the weld location as possible to provide a good path for the current during the weld time.
6. Ensure that the welding electrode tip is dressed to a fine, slightly rounded point. Set the 'On/Off' switch to 'On'. Place the electrode firmly onto the work piece and depress the micro-switch in the pistol grip.
7. To use the roll spot wheel, unscrew the PG2 electrode, and replace it with the brass wheel holder. Set the 'Single/Repeat' switch to 'Repeat'.
8. Set the 'Rest' time to 5 cycles and the 'Weld' time to 2 cycles. The weld pitch can be adjusted as required by changing the 'Rest' time.
9. Holding the hand attachment in the air, initiate the weld, and adjust weld interval as required by looking at the 'Weld Go' LED flashing and adjusting the 'Rest' time.
10. Ensure that the grounding clamp is attached to the work piece as close to the weld as possible.
11. Place the wheel on the sheet, press firmly, depress the micro-switch and keep depressed. Start to move the wheel along as soon as the switch is depressed and maintain pressure until after the switch is released or holes will be burnt in the sheet.
12. To use the PG5 or PG5M hand attachments, push the copper jack plugs into the two sockets on the right of the welder, and the switch jack plug into its socket.
13. Set the 'Single/Repeat' switch to 'Single' and set the 'Weld' to 4 and 'Power' to 50%. To operate, place the sheet or wire to be welded between the electrodes and squeeze the pressure lever into the grip. The weld will initiate and stop after the time set on 'Weld'. Pressure must be fully released before further welds can be made.
14. Pressure and point of initiation can be adjusted by the screw above the moving electrode.
15. With all Hand attachments increase power gradually until a test weld on a sample is stronger than the parent metal and a 'slug' can be pulled.
16. Generally as the thickness of the sheet or wire varies, increase or decrease the power to suit. Always weld with the lowest Power setting and the shortest weld time commensurate with a good weld.

EXAMPLE PROJECT SETUP #2

1. Check that the welder is connected to the correct voltage as shown on the serial number plate on the left side of the welder.
2. Turn the welder on. 'Power On' LED will illuminate.
3. Set 'Rest' time to 5 cycles
4. Set 'Weld' time to 2 cycles
5. Set 'Single/Repeat' switch to 'Single'
6. Set weld cycles switch to 'Normal'
7. If equipped set power range to 1. Next set power to 40%.
8. Position grounding clamp as close as is conveniently possible to the weld area and, holding the hand attachment away from the job, depress the micro-switch several times to ensure correct operation. Each time you depress the weld switch, the 'Weld Go' LED will light.
 - If using either the PG5 or the PG5M pliers Hand attachments, place a piece of insulation of some sort between the tips to ensure correct operation before carrying out actual weld test.
9. Now bring the hand attachment down to the weld position, hold electrode tip firmly against the surface to be welded, and depress micro-switch.
 - On all machines, whether the switch is merely touched or held down for the whole weld time, the weld will take place for the actual weld time selected on the timer.
10. Test the weld obtained, and if not satisfactory, increase the weld power by turning the power range up from '1' to '4', trying welds at each position and on each power setting, turning the Power knob potentiometer up from 40% to 100% as necessary. (Power range 1: Power 40% to 100%, power range 2: Power 40% to 100%, etc.)

EXAMPLE ROLL SPOT & SEAM WELDING SETUP

1. When using the roll spot technique, set the 'Single/Repeat' switch to 'Repeat'
2. Set the 'Rest' and 'Weld' time to suit the application
3. Ensure that the 'Weld Cycles' switch is set at 'Normal'
4. While holding the hand attachment away from the job, hold down the micro-switch, and watch the 'Weld Go' LED indicating the pulsing of the weld.
5. Adjust 'Rest' time to give required interval between welds. Setting the knob to "0" will set the machine in seam mode.
6. When satisfied with settings, press the roller wheel firmly against the job, depress the micro-switch and while holding it on, move the wheel slowly along the work piece maintaining as constant a pressure as possible.
7. Ensure that you release the micro-switch before removing the wheel from the work piece.

OTHER RECOMMENDATIONS

1. The shortest weld time, consistent with doing a satisfactory weld, is the best as heat in both the hand attachment and cables is kept to a minimum.
2. Better results will be obtained by moving the ground clip closer to the weld, than by increasing either the weld time or the weld power.
3. Keep the electrode tip diameter to the absolute minimum.
4. Maximum gauge that can be welded is 2 x .75mm. In all cases, the maximum thickness can be welded, either to itself, or to anything thicker.

5. Generally speaking, short weld times and high power settings will give the best results.

WELDER INFORMATION

SPECIFICATIONS

MAINS SUPPLY:

	2.2kVA	5.0kVA	15kVA
Primary Voltage	240 (1-phase)	240 (1-phase)	415 (2-phase)
Max Weld Cap. (PG2)	2 x 0.5	2 x 0.75	2 x 0.75
PG6	--	--	2 x 1.25
Short Circuit Current	2100 A	2500 A	4250 A
Short Circuit Voltage	4.5 V	5.8 V	8 V
Weight	44 lbs	105 lbs	121 lbs
Dimensions (in)	14.0 x 10.2 x 13.0	21.3 x 12.6 x 13.4	21.3 x 12.6 x 13.4

RESISTANCE WELDING

WHAT IS AC RESISTANCE WELDING?

Alternating Current (AC) welding uses electric voltage directly from an alternating current outlet. AC flows half the time in one direction and half the time in the other, changing its polarity 120 times per second. AC welders have advantages over other welder types:

- Welds magnetized metal very well.
- Welds thicker metals.
- Makes clean welds that require little or no sanding or filling.

WELD FORMATION

Spot welding relies on metal resistivity (resistance) to heat and fuse metal. A large current is passed through the workpiece metal. Energy is dissipated due to metal resistance in the form of heat which melts and fuses the weld materials. There are two phases to the melting process. The welder must overcome both the material contact resistance and the bulk resistance of the material.

On the micro-scale, material surfaces are rough and only contact in a limited number of locations. In the first few milli-seconds of weld formation, the high-resistance metal bridges melt, allowing other bridges to come into contact to continue the melting process. When all of the bridges have fused, the contact resistance is zero. The bulk resistance of the metal then plays the final role in the weld formation. On the micro-scale, surface roughness limits surface-to-surface contact. More contact points result in a lower contact resistance.

TIPS

WELD PRESSURE

Several other factors play a part in the contact resistance. The larger the contact resistance the hotter the resultant weld. On the micro-scale, contact resistance is reduced when more metal bridges or contact points are formed. Using more electrode pressure creates more metal bridges. This results in a lower contact resistance and a cooler weld. Conversely, light electrode pressure results in less metal contact, higher resistance, and a hotter weld. An appropriate amount of pressure should be used to ensure good weld strength.

ELECTRODE CONFIGURATIONS

Figure 1 shows several electrode configurations used in resistance welding. Figure 1a is called a direct weld. Current is passed from one electrode through both workpieces and out an opposing electrode. Figure 1b shows a step electrode configuration. This configuration is used when there is access to only one side of the workpiece and an electrode can be placed on both materials. Figure 1c is a series configuration. Electrodes can only be placed on one metal surface from one side. Current is divided between the two parts. This weld configuration requires more weld energy.

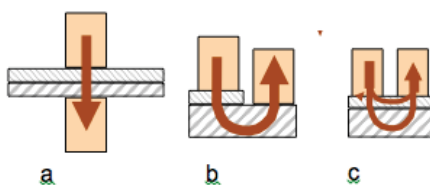


FIGURE 1: Examples of resistance welding electrode configurations: a. direct, b. step, c. series.



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