

Single Pulse Resistance Welder Instruction Pamphlet

CD125SP High Accuracy CD Welder

- Single pulse operation
- Available in 125ws
- Pulse width adjustable from 0.1% to 100% energy discharge
- Up to 166 welds/min
- Simple, user-friendly interface



CD125SP

Fundamentals of Capacitive Discharge Resistance Welding

Capacitive discharge resistance welding uses large capacitors to store energy for quick release. Figure 1 shows a typical capacitor discharge curve.

Capacitive resistance welders have many advantages. Weld nugget formation takes place during the first few milli-seconds. Capacitive discharge welders allow extremely fast energy release with large peak currents. More of the energy goes into weld formation and less into heating surrounding material. The heat affected zone, where the properties of the metal have been changed from rapid heating and cooling, is localized to a small area around the weld spot. The quick discharge rate of CD welders also allows electrically and thermally conductive materials, such as copper and aluminum, to be welded. Capacitive

welders deliver repeatable welds even during line voltage fluctuations.

Spot welding relies on the principle of metal resistivity to heat and fuse metal. A large current is passed through the work piece. Energy is dissipated due to the metal resistance in the form of heat which melts and fuses weld materials. There are two phases to

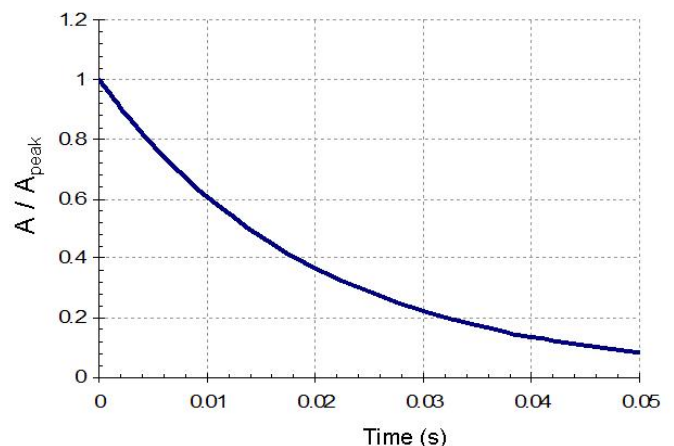


Figure 1: Sample capacitor discharge curve.

the melting process. The welder must overcome the material contact resistance and the bulk resistance of the material. Figure 2 shows an example micro-scale surface profile. 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 these high resistance, microscopic metal bridges melt allowing other bridges to come into contact and fuse. When all of the bridges have fused the contact resistance equals zero. The bulk resistance of the metal then plays the final role in the weld formation.

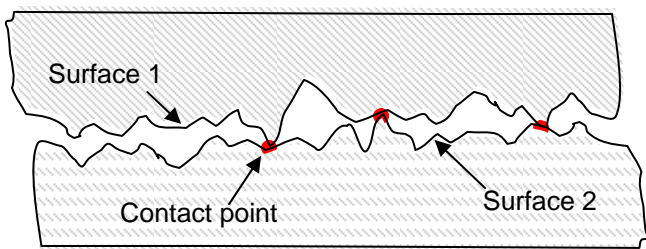


Figure 2: On the micro-scale surface roughness limits surface to surface contact. More contact points results in a lower contact resistance.

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 (see Figure 2). Using more electrode pressure creates more metal bridges. This results in a lower contact resistance and cooler weld. Conversely, light electrode pressure results in less metal contact, higher resistance, and a hotter weld.

Figure 3 shows several different electrode configurations used in resistance welding. Figure 3a is called a direct weld. Current is passed from one electrode, through both work pieces and out an opposing electrode. Figure 3b shows a step electrode configuration. This configuration is used when there is access to only one side of the work piece and an electrode can be placed on both materials. Figure 3c 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.

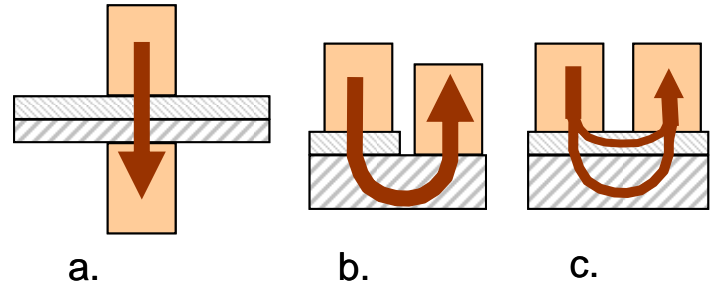


Figure 3. Examples of resistance welding electrode configurations: a.) direct, b.) step, c.) series.

A capacitive discharge welder controls the voltage of the welding capacitors. However, the energy stored in the capacitor is a function of the voltage squared ($E = \frac{1}{2} \cdot C \cdot V^2$). This relation states that a small difference in voltage makes a large difference in weld energy. The energy adjustment knob on Sunstone spot welders is indicated in watts*seconds (joules) to eliminate the potential confusion between the linear voltage control and the voltage square energy relation.

Using Sunstone Single Pulse Welders

Weld Energy Indication

Figure 4 shows the Sunstone Engineering Single Pulse CD welder front panel. Weld energy is indicated by a 10 level display bar and is adjusted in watt-seconds (ws). When maximum energy has been reached the display will begin flashing.

Pulse Control

Sunstone Single Pulse welders have one knob for pulse energy control. Pulse energy is adjustable between 3% and 100% of the total stored energy.

Power Adjustment

Each Sunstone welder is fully adjustable between its minimum and maximum energy. The welders have a moderate charge time if used by themselves. Welders are intended for use with an additional external power supply

booster. When used in conjunction with a fast charging booster weld repetition rates of up to 166 welds/min (the hardware defined limit) are possible. The weld energy set-point is usually chosen to minimize cycle time and is typically set to around 80 percent of the maximum value. This corresponds to a 16 volt setting on the fast charging booster power supply. Pulse width is then adjusted to provide the appropriate energy into the weld.

to speed-up the cycle time of the welder. The Sunstone Engineering PS25A power supply is adjustable between 6 and 18V (11 – 100% welder energy). The PS35A booster is adjustable from 13 to 18V (50 – 100% energy). A welder to power supply hook-up cable is included with each power supply. The connector on the cable is polarized for proper insertion into the welder port. For power supply hookup the red banana plug is inserted into the positive supply terminal (red) and black

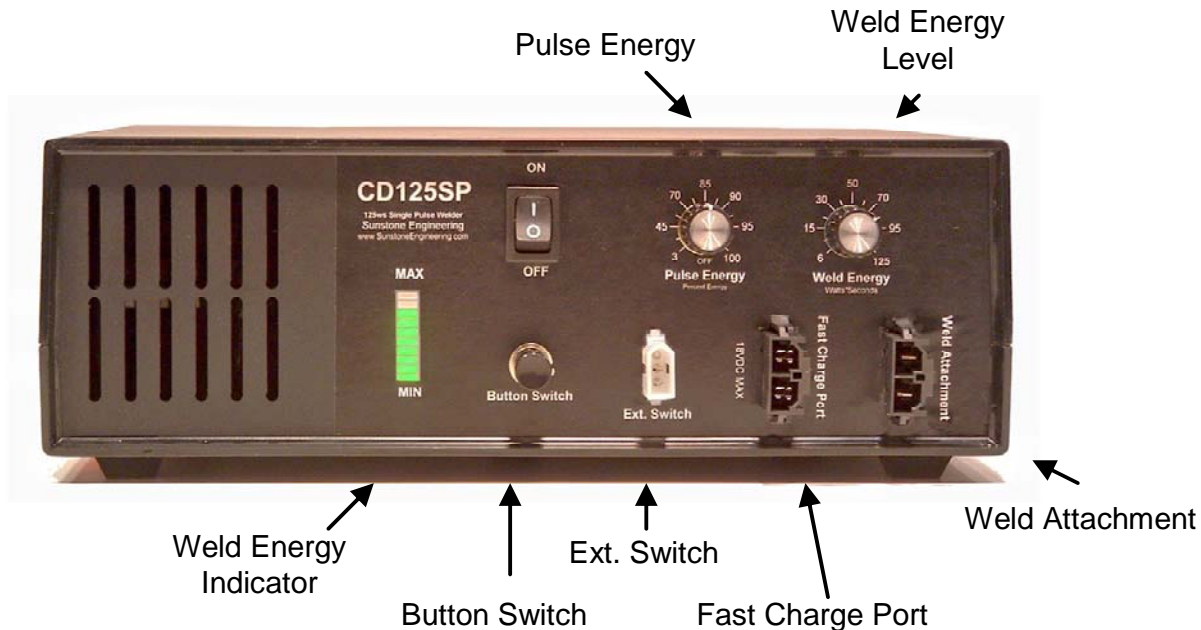


Figure 4: The CD125SP single pulse CD resistance welder front panel

Weld Actuation

All Sunstone welders come with a panel mount button switch. The welders also have a port for a foot switch or other external normally open switch. The external switch connection is made with a Molex 03-06-1038 connector and 02-06-1103 terminals. The bottom two pins in the ext. switch connector pictured in Figure 4 are used in the NO circuit.

Fast Charging Port

As discussed, the welders are intended for use with a charge booster / fast charging power supply. The fast charging port on the welder allows an external, high current power supply

into the negative terminal (black). When using alternate external power supplies it is critical that the user does not exceed 18VDC into the fast charging port. Doing so will damage the welder and void its warranty.

Weld Attachments

Sunstone Engineering produces a variety of welding hand pieces and weld heads to accommodate a diverse range of welding applications. Hand piece welding attachments allow ease of use and versatility, while fixed weld heads provide control and precision. To simplify setup, all welding attachments use a high current snap-in connector. Sunstone welders can also be used with other manufacturers weld heads through the use of an adapter cable. Sunstone Engineering

does not recommend that the user assemble an attachment connector without proper tooling. A “pig tail” connector can be purchase with free wire ends to construct custom welding attachments.

Back Panel

All Sunstone Welders use a 24VDC power supply. A 2.1mm ID 5.5mm OD connector is located on the welder back panel. The fuse holder (located on the back panel) accepts 5 x 20mm 5A fuses.

SAFETY

Please follow these points to help insure your comfort and safety.

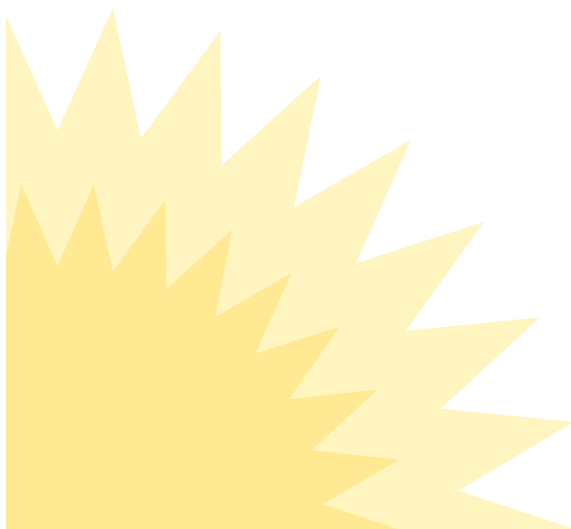
1. Always wear safety glasses when working with spot welders and weld heads.
2. Avoid touching welds spots immediately after the weld has been performed as they will be hot.
3. Be careful not to pinch fingers in moving weld head parts or between welding electrodes.
4. Remove hand jewelry before welding.

All welds are performed at low voltage for increased safety of operation.

Additional Information

For additional information and instructional videos please visit our web pages.

www.SunstoneEngineering.com



Sunstone Single Pulse Resistance Welder Technical Specifications

Feature	CD125SP
Pulse Energy Adjustment (% of set-point energy)	3%-100%
Peak Current (typical)	1200 Amps

Single Pulse Welding Speed

Pulse Width	Rep Rate CD125SP (welds/min)
3%	166
25%	166
50%	155
100%	150

Sunstone Single Pulse Resistance Welder Pulse Characteristics

Model	Min Output	Max Output	Capacitor Bank	Pulse Width		Rise Time	Min Pulse Height
				Min	Max		
CD125SP	0.2 ws	125 ws	800,000 μ F	0.5 ms	17 ms	10's of μ s	4.0 V
						10's of μ s	4.0 V

Physical Characteristics

	CD125SP		PS25A (booster)		PS35A (booster)	
	Inches	cm	Inches	cm	Inches	cm
Height	3.6	9.1	7.1	18.0	5	12.7
Width	10.3	26.2	9.1	23.1	9.2	23.4
Depth	12	30.5	11.8	30.0	14	35.6
Weight	5 lbs	(2.26 kg)	20 lbs	(9.1 kg)	29 lbs	(13.2 kg)

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