How To Set Up A Resistance Spot Welder

Fabricators who are concerned with producing consistent quality welds should understand that electrode force, weld time duration and weld current intensity are closely related and a change in one parameter will affect the others. Increasing only the current without adequate weld force could result in severe expulsion or weld splash. A change in force without corresponding changes in current and weld time can also result in poor welds.

Since the majority of resistance welders are of single phase AC type, it is important to consider the effects of electrical impedance when setting up a resistance welder. Due to reduced efficiency caused by an impedance, a single phase AC type welder with a long throat depth and/or a wide throat gap may not have the same capacity as a short throat/short gap welder of equal KVA rating. When any magnetic material, such as mild steel, is placed into a throat of a welder, the impedance is increased, further reducing weld current at the electrodes. For this reason, weld samples should always duplicate actual workpieces in terms of mass and resultant impedance.

Consult the recommended weld schedules included in this catalog to help determine the required electrode force, weld current (secondary amperage) and weld times necessary to achieve the weld quality classification specified for the application. **Note:** *that while weld schedules may list permissible variations which show a 10 to 30 percent reduction in weld strength for a specific type and thickness of material, an even greater difference may occur in weld appearance*. Be sure to select the schedule which provides the strength and cosmetics required for the application.

While it is possible to set up a resistance spot welder without instrumentation, a weld current and time analyzer and an accurate weld force transducer with analog or digital readout should be employed for best results.

SET-UP PROCEDURES

As with all machinery, a safety inspection should be made to assure proper installation and use of the welder. Operators must wear suitable eye protection and shop clothing. The manufacturer's operating manual should be reviewed to familiarize operating personnel with the functioning of the welder as well as any special features.

If the welder OEM has provided a Set-Up/Run switch on the control unit, be sure to place the switch in the set up position. This will disengage the initiation switch (usually an electric foot switch or palm buttons) and provide an additional safeguard when aligning or changing tooling and electrodes. If a selector switch has been provided for the foot switch mode of operation (single stage/double stage), you may choose either position.

The following procedures are based on use of a pneumatically operated, single-phase AC spot welder equipped with a NEMA type S2H four sequence control with phase shift current selection.

1. Turn on the compressed air and water to the welder. Check for adequate water flow and air pressure, then turn on the electrical power to the welder. **NOTE:** Air and water should be turned on before power. Some installations may incorporate an electronically operated solenoid valve which turns on the water only when the power to the welder has been turned on.

2. Adjust the air pressure regulator to the required air pressure to obtain the desired electrode force. Some welders may have a force chart attached to the machine to indicate weld force based on the air cylinder size and incoming air pressure. Rocker-arm type spot welders may not have a force chart as the force may decrease according to the throat depth. Actual weld force should be verified with a weld force transducer or gauge.

3. Energize the welder control panel if a separate switch was provided for this purpose.

4. Set "Squeeze" time to the maximum setting.

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5. Adjust “Weld” time (also referred to as weld count or heat time) sequence to the recommended setting for the type and thickness of material to be welded.

6. Set “Hold” time sequence to provide adequate time for the hot weld nugget to cool while held under the electrode force.

7. Set “Repeat” switch to non-repeat position.

8. Consult welder OEM’s operating manual or specification sheet to determine nominal maximum weld current which can be produced at the throat depth you are using. The maximum rated current should exceed the amount needed to produce the weld quality specified for your application. The actual maximum current will be affected by any increase or decrease in primary line voltage. Connecting a 220 volt welder to a 208 volt primary electrical supply would decrease the rated maximum weld current by 5%.

9. If the welder transformer is equipped with a tap switch, adjust the tap to the position which approximates the required weld current output and set phase shift at 50%.

If a tap switch is not provided (controls that contain phase shift weld current regulation have in many cases, eliminated the need for tap switches and series parallel switches), adjust the control’s phase shift to the percentage which corresponds to the weld current needed. **CAUTION: Since welder OEM’s usually measure maximum weld current output in short circuit without a workpiece between the electrodes, actual “working weld current” will be less and should be verified with a weld current analyzer, which is available from LORS Machinery, Inc.**

10. Place the “Weld/No Weld” switch into the “No-Weld” position.

11. If so equipped, use the electrode alignment valve to bring the electrodes together without air pressure. Check the electrode alignment and stroke. Electrodes should meet squarely. Unlike other metal working machinery, a resistance welder should not operate at the end of it’s stroke. A short stroke will deliver full force in accordance with the cylinder size and air line pressure. The stroke should be set as short as possible to minimize pinch points, yet allow the workpiece to be fed into the welder.

NOTE: IT IS THE RESPONSIBILITY OF THE USER TO PROVIDE ALL NECESSARY GUARDS AND SHIELDING. MAKE SURE THAT FINGERS, CLOTHING OR OTHER ITEMS ARE IN THE CLEAR AND AWAY FROM ALL PINCH POINTS.

12. If applicable, place the welders “Run/Set-up” switch in the “Run” position.

13. Initiate and operate the welder through a complete sequence with parts between the electrodes. Check tip alignment, downstroke and upstroke speeds and adjust the speed control valve if necessary. Excessively fast downstroke speeds can cause “hammering” of the electrodes resulting in the deformation of the electrode face and reduce tip life. Slow speeds may require longer squeeze time and will in turn slowdown operation.

14. Place the “Weld-No Weld” switch in the “Weld” position.

15. Place a sample workpiece between the electrodes, exercising care to keep fingers, clothing, etc. in the clear. The sample should duplicate the actual welding conditions regarding material type, thickness and impedance in the welder throat.

16. Initiate and sequence the welder. Check the weld current and time analyzer to determine actual current and time. If the analyzer shows a lower or higher current than desired, adjust the phase shift accordingly. Increase in 1% increments. Repeat this step until you obtain as close as possible the required weld current. Do not weld over a previous weld. Use a different sample workpiece.

17. Remove and examine welded sample. Indentation should not exceed 10% of the material thickness.

18. If testing discloses a weak weld or a no weld condition, it will be necessary to increase weld current intensity as in step #16. If, on welders having transformer taps and phase shift, and 99%/100% is reached before a good weld is obtained, advance the tap switch one step and reduce the phase shift to approximately 80% and repeat step #16.

19. When satisfactory welds have been made, the squeeze and hold sequence times may be adjusted to optimum settings. Consult weld schedules for recommended hold times.

20. If automatic repeat welding is required, place the “Repeat/Non-Repeat” switch into the “Repeat” mode and adjust the “Off or Interval” time sequence to a sufficient length of time to permit the workpiece to be moved into position for the next weld. When welding in “Repeat” mode, a spotwelder will continue to sequence and weld for as long as the operator continues to keep the initiation circuit energized.

As with any welding process you may sometimes encounter difficulty. If you stop to examine what you are doing, you will usually find that the problem can be corrected. The most common cause of spotwelding problems is the failure to properly select and maintain the electrodes. Poor electrode life is usually traced to improper water cooling and/or incorrect weld schedules. Excessive weld times do not make better welds and will result in poor weld appearance, as well as, shorter electrode life.

Refer to the chart below for a general trouble shooting guide, which list some resistance welding problems and their possible causes. A better understanding of the resistance welding process and how to use it will enable you to increase your spotwelding productivity and improve the quality of your welded assemblies.

✻ PRIMARY CAUSE ◆ SECONDARY CAUSE		TYPE OF WELD DEFECTS					
POSSIBLE CAUSE OF WELD DEFECT		**WEAK WELD**	**EXPULSION OR WELD SPLASH**	**ELECTRODE MUSHROOMING**	**EXCESSIVE WELD MARKING**	**ELECTRODE STICKING**	**NO WELD**
WELD CURRENT	LOW	✻			◆		✻
	HIGH		✻	◆	✻	◆	
WELD TIME	SHORT	✻					✻
	LONG		✻	✻	✻	◆	
WELD FORCE	LOW	◆	✻		◆	◆	
	HIGH			✻	✻		◆
SHORT SQUEEZE TIME			✻		◆	✻	◆
INCORRECT FOLLOW UP			◆			◆	
INADEQUATE COOLING		◆		✻	◆	◆	
ELECTRODE FACE DIAMETER	SMALL	✻	◆		◆	◆	
	LARGE	✻					◆
POOR METAL FIT UP		✻	✻		✻		✻
DIRTY OR SCALY METAL		◆	◆			◆	✻
TOO CLOSE WELD SPACING		✻					◆
INCORRECT WELD TOOLING SETUP		◆	◆				◆
INCORRECT ELECTRODE ALLOY		◆		◆		◆	

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