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UNITEK EQUIPMENT®

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World Leader in Precision Metals Joining

Simplified Schedule Development Procedure for Battery Pack Manufacturers Model 250DP

INTRODUCTION:

Battery pack manufacturers are often faced with having to quickly bring to production new cell pack designs which utilize various tab materials and cell types. This procedure will help reduce the time required to develop schedules for these tab to cell welds. It is not intended to preclude weld schedule optimization, nor does it address every aspect of battery pack welding. It should be used as a guide for quickly finding acceptable schedules for tab to cell welding.

GENERAL:

The typical tab materials used for pack manufacturing are .005" thick, 1/4 hard Nickel 200 or Electro-Plated Nickel Plated Steel. Battery caps are normally made from Nickel Plated Cold Rolled Steel. This procedure assumes that these typical materials are used. Lithium-Ion "button cells" and prismatics require special process considerations, and are not covered by this procedure.

Electro-Plated Nickel Plated Steel tab to 18650 Li-Ion cell.

EQUIPMENT LIST:

Model Number	Description	Quantity
250DP	Dual Pulse Stored Energy Power Supply	1
88A/24	Series (Dual) Weld Head	1
ES0850ES	0.062" Dia. Eccentric Tip Glidcop Electrodes	2
FS1L	One Level Footswitch	1

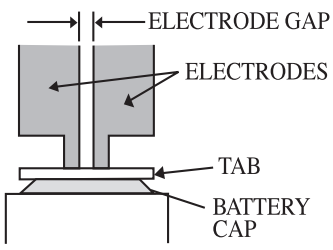
SETTINGS:

The table below shows recommended initial settings and the typical range of settings for battery pack welding:

EQUIPMENT	PARAMETER	INITIAL SETTINGS	TYPICAL RANGE
250DP	Pulse 1	5.0 %	5.0 - 15.0 %
	Pulse 2	0.0 %	15.0 - 30.0 %
	Pulse Width	Short	Short
88A/24	L & R Electrode Force	3.5 lbs (16 N)	3.0 - 6.0 lbs (13-27 N)
	L & R Force Tubes	3.5 Units	3 - 5 Units
	L & R Air Regulators	25 PSI	20 - 45 PSI
	Electrode Gap	.050"	.035" - .065"

Table 1: Initial Settings and Typical Range

ELECTRODE SET-UP:



TECHNICAL APPLICATION BRIEF

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WELD SCHEDULE DEVELOPMENT PROCEDURE:

Notes: The electrode faces should be resurfaced periodically during the schedule development process. The electrodes should be resurfaced or replaced whenever a "blow-out" occurs.

It is unlikely that the positive and negative ends of the battery will require the same energy and force settings. Use this procedure as appropriate to develop an acceptable schedule for each end.

1. Use the "INITIAL SETTINGS" from Table 1 as a starting point. The left and right air regulators should be adjusted to provide just enough pressure to close the firing switches.

Note: It is important that electrode speeds are moderate and no overforce is present. This should be measured using a force gauge.

2. PULSE 1 is used to break through plating and seat the electrodes. Make a weld using the initial setting of 5.0 % and pull the tab from the battery cap. If required, increase the energy setting in steps of 3.0% until the parts just barely stick together. When this slight sticking is achieved, decrease the energy setting 1 - 2 %. This is your PULSE 1 setting.

3. PULSE 2 is the weld pulse. Set the energy level to two times the level of PULSE 1. Make a weld and pull the tab from the battery cap. If required, increase the PULSE 2 energy setting in steps of 5.0% until an acceptable pull strength is achieved. Do not adjust PULSE 1 at this time. If an acceptable pull strength cannot be achieved, continue with the following steps.

4. The LEFT & RIGHT FORCE settings will affect the weld heat. An increase in force results in less heat, a decrease in force results in more heat. Increase the LEFT & RIGHT FORCE TUBE settings by one unit each. One unit on the FORCE TUBE equates to about 1.5 lbs (6.7 N) of ELECTRODE FORCE.

5. Adjust the LEFT & RIGHT AIR REGULATORS to provide just enough pressure to close the firing switches. There should be no extra air pressure, otherwise overforce will result.

6. Set PULSE 2 back to 0.0% energy. Repeat Steps 2 through 5 until an acceptable pull strength is achieved. It may be necessary to balance the weld nugget sizes by independently adjusting the LEFT & RIGHT FORCE settings in Step 4.

7. Do not adjust the PULSE WIDTH setting. Do not adjust the ELECTRODE GAP unless absolutely necessary. An ELECTRODE GAP of less than .030" will result in current shunting across the tab.

8. When an acceptable pull strength is achieved, document the weld schedule for future reference.

Electro-Plated nickel plated steel tab to NI-MH cells.

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