SOP for LG Chem & SDI Battery Charging

Safety Instruction

Current Levels (Milliamperes, mA)	Probable Effects on the Human Body
1 mA	Perceptible tingling sensation. Possibly dangerous under certain conditions.
5 mA	Shock sensation. Strong involuntary reactions. Possible injury may occur.
6 mA - 16 mA	Painful shock, loss of muscular control may occur.
17 mA - 99 mA	Respiratory arrest may occur, severe musuclar contractions and extreme pain. Death is possible.
100 mA - 2,000 mA	Ventricular fibrillation, muscular contractions, and nerve damage occurs. Death is likely.

Electrical Shock Warning:

Make sure you have protective equipment before you start working on this project. Electrical shock could happen during the process.

Please make sure you read all instructions and follow step-by-step

DC Power Supply Set-up

1. Use the clamp cable wire end and connect the + and – wires to the + and – output terminal on the DC power supply. Shown in picture to the right.

2. Make sure you connect the charging cable to the inner output terminal on the power supply, the left side is positive and the right side is negative. Shown in picture to the right.

3. Connect the DC power source to the outlet after connecting the charging cable

DC Power Supply Front Panel Overview

1. From left to right is Power Button, Voltage Control, Current Control, Model Control

2. Always make sure the power supply is in STANDBY mode **before you turn on the supply; before you connect the clamps to the battery, and before you disconnect the clamps**

This means the STANDBY mode should be always on if the battery is not charging

The picture on the right side indicates the STANDBY mode is ON, push the red button down to switch STANDBY mode on/off

Supply Voltage/Current

1. The output voltage/current needs to be set manually accordingly to charge the battery

2. For the LG Chem battery, set voltage/current to 47V/17A, For the SDI battery, set voltage/current to 40V/17A

3. Push and hold the OVP button to see the overview of the Current/Voltage(I/V) that has been set up

4. To change the parameter of I/V, push and hold the OVP button, and use the voltage/current turning switch on the left to tune the I/V to the proper parameter.

Make sure STANDBY MODE is enabled during this stage

Battery Set-up

1. Place no more than 4 batteries each time on the rack, 3 batteries is ideal because a reasonable space is needed between each battery.

2. Recommended to Have at least 2 people move a single battery to the rack.

Be extra cautious, each battery weight more than 100lb

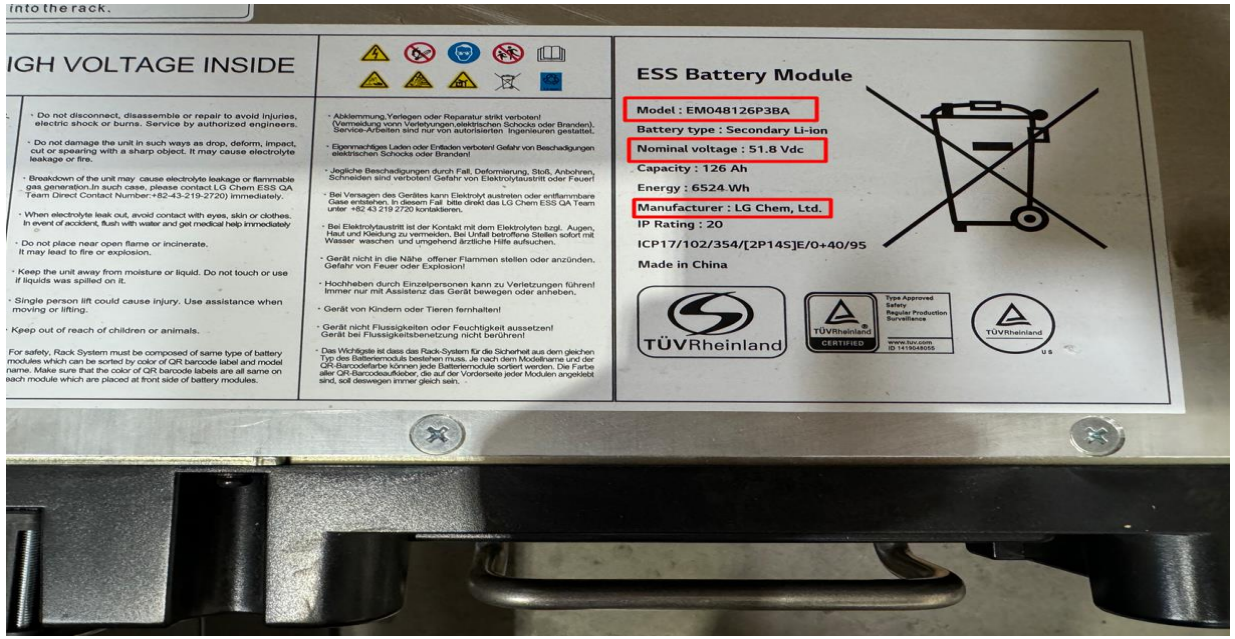
Battery Specs

1. The model number/nominal Voltage, etc. can be found on top of the battery and the SN can be found on the front panel of the battery

2. Use a sticky note or Excel to record the model, SN, starting voltage, and charging date

3. The nominal voltage rating of SDI and LG Chem for ESS176KWh should be around 50V.

4. Always measure the starting voltage before you establish a connection between the power supply and the battery. If you see the starting voltage is lower than 10V, in most cases that means this battery cell is in bad condition. **Put aside and do not charge.**



Battery Voltage Measurement - 1

1. Before establishing a connection between the power supply and the battery, a starting voltage measurement is needed.

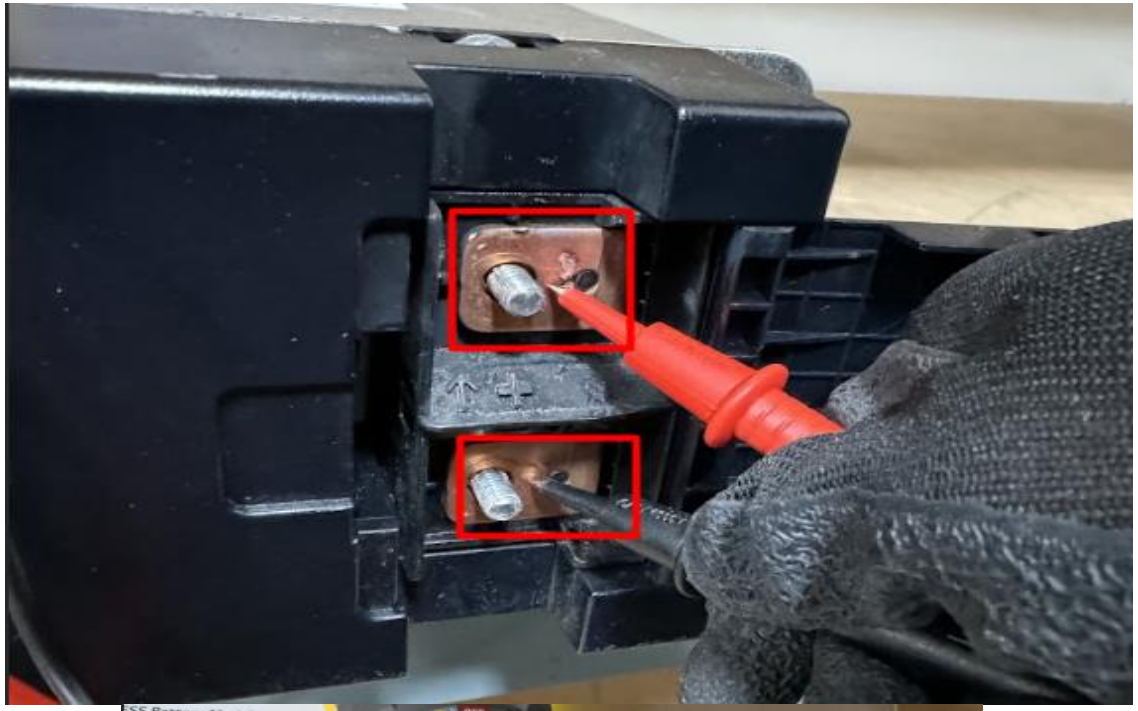
2. To measure the DC voltage, use the multimeter and switch to DC voltage measurement, once the multimeter is set to DC voltage measurement, you will see a DC sign on the LED screen of the multimeter.

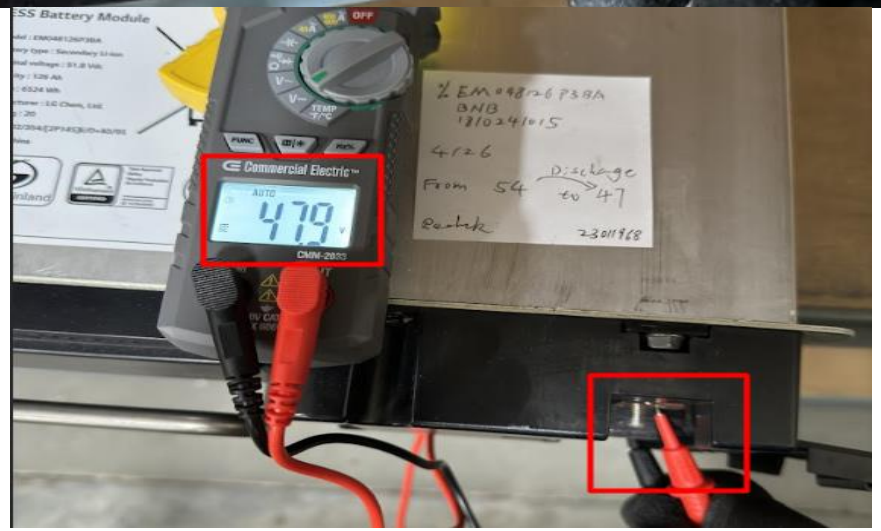
Battery Voltage Measurement - 2

1. After the multimeter is set to the correct mode, simply make contact using the + (Red) and – (Black) pin from the multimeter to the + and – charging terminal on the battery

2. Make sure you are making contact with the conductive metal plate on the battery, otherwise, you won't get any voltage reading.

3. Record the starting voltage reading, and turn the multimeter to off mode. **Always wear protective gloves during this stage.**





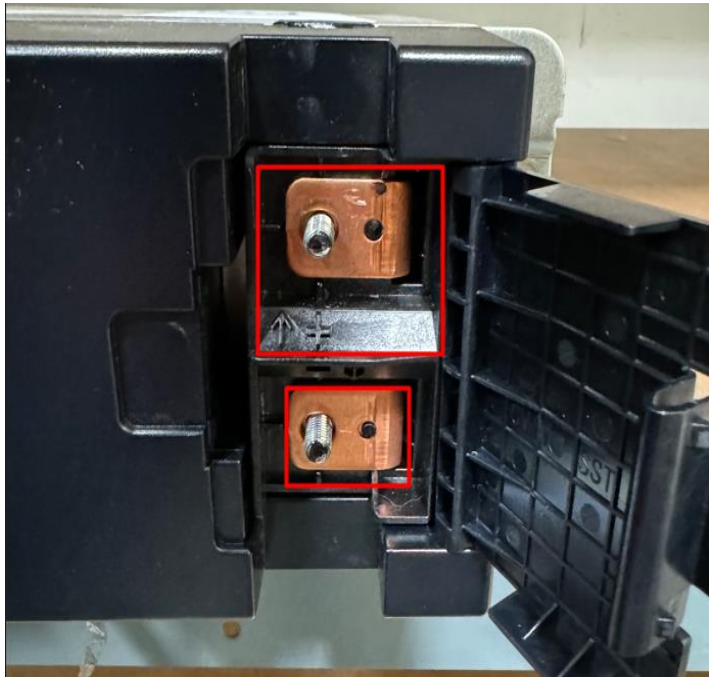
Battery Charging Terminal

1. Before connecting the clamp charging cable to the battery, is turned OFF.

2. The top plate is the + terminal, and the button is the – terminal. Use the red clamp to make the connection for the top plate and the black clamp for the bottom plate, start with + terminal then – terminal.

3. Make sure the clamp is flush against the metal plate or else no voltage will be detected.

4. The spark might be coming out of the contact point when making a connection, so do not look too close to the terminal and **always wear protective gloves**



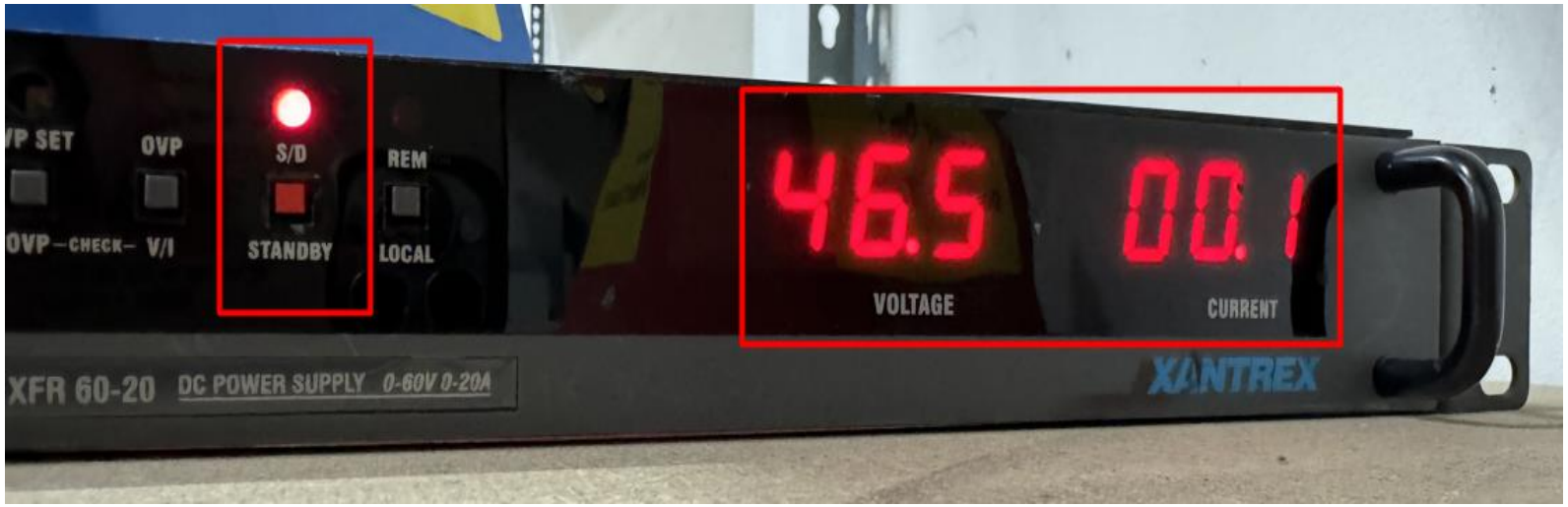
Make sure STANDBY MODE is enabled during this stage

Battery Charging Procedures

1. If you establish a proper connection between the power supply and the battery, you should see the battery voltage measurement from the power supply LED screen once you turn on the power supply. The current will be 0 but it is normal.

2. If a proper connection has been established, simply release the STANDBY button to start changing **(Make sure you set the correct I/V based on page #5)**

3. Always make sure the power supply is in STANDBY mode **before you turn on the supply; before you connect the clamps to the battery, and before you disconnect the clamps**



Again, make sure STANDBY MODE is enabled during this stage

Battery Charging Procedures - Continuous

1. Once you start the charging process, the standby mode is released, you will see the red light on STANDBY disappear, and the I/V starts to increase

2. A single battery charging could take up to 1 ~ 2 hours.

3. Continue monitoring the I/V for a few minutes, and then you can leave the battery for charging. Sometimes a bad connection could happen, and you will see smoke coming out of the charging port, or the I/V decreases and drop to 0.

4. If you observe the drop-down in I/V or smoke coming out of the charging terminal, put the power supply to STANDBY and re-establish the clamp connection. **Always wear protective gloves as the spark will flash out of the contact point.**

Battery Charging Procedures - End

1. As voltage increases and reaches close to the pre-set voltage on the power supply, the current will decrease to slowly charge the battery to prevent overcharging

2. Continue charging the battery until the current decreases to 1.0A. Check every 30 minutes to ensure the battery is charging at an optimal condition.

3. Once the charge current drops to 1.0A, enable STANDBY mode and disconnect the battery side connection, start with – terminal and then + terminal.

4. After finishing the charging, measure the voltage again and record the measurement and charge date.

5. Batteries need to get a **voltage re-check** after 7 days from charge. If the voltage drop is less than 1V, then this battery can be marked as in good condition.

Important Notes

1. Make sure the + and - charging clamps never touch each other during the whole process.
2. Some batteries might need discharge, if you ever encounter this situation, report it to your supervisor
3. Make sure all necessary information is recorded for future reference (model, SN, date of charge, box number)
4. Make sure to have the repair log filled out during/after the inspection
5. The connection between the power supply and battery could be unstable, it is recommended to check on the whole system every 30 minutes during charging.

Inspection Record Demo.

A	B	C	D	E	F	G	H	I	K	L	N
Pallet/Box Number	**Box ID**	**RMA#**	**Model**	**SN**	**Start Voltae**	**Good/Bad**	**Date of Charge**		**Recheck Date**		**Recheck Voltage**
1	13638 (x 17)	22001524	%EM048126P3BA	EM048126P3BABNA1810291174	21.3	GOOD	4/15/2024		4/23/2024		46.4
1	13638	22001524	%EM048126P3BA	EM048126P3BABNA1810291172	19.6	GOOD	4/16/2024		4/23/2024		46.3
1	13638	22001524	%EM048126P3BA	EM048126P3BABNB1810241151	50.14	GOOD	4/25/2024		4/26/2024		46.9
1	13638	22001524	%EM048126P3BA	EM048126P3BABNA1810291173	19.7	GOOD	4/16/2024		4/23/2024		46.5

Example of the necessary information to be recorded during the whole process.

Smarter. Greener. Together.

To learn more about Delta, please visit www.deltaww.com.