ULTIMO™ Lithium Ion Capacitor

(Laminate Cell Series)

Operation Manual

JM Energy Corporation

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SAFETY PRECAUTIONS

The following marks indicate notes you should pay attention to in this documentation. Please read these notes and understand their contents before using the product.

■ This User's Manual uses the following marks to explain safety precautions.

Danger	Misuse of the product "**would very likely result in death or serious injury**."
Warning	Misuse of the product "**might result in death or serious injury**."
Caution	Misuse of this product "**might result in injury or property damage**."

■ The following marks indicate rules for you to observe.

	This indicates a "**prohibited**" action.
	This indicates a "**must**" action.
	This indicates a general "**cautionary note**."

About this User's Manual

1. No part or whole of this Manual may be reprinted without approval.
2. Contents of this Manual may change without notice.
3. Every effort was made to ensure the accuracy of the contents of this Manual. Should you have any questions, or notice inaccuracies or omissions, please contact us.
4. We are not responsible for anything that occurs due to actions contrary to the instructions of this Manual.
5. After reading this Manual, please keep it in a safe place and have it with you for reference whenever you use the product.

ULTIMO™ is a large-capacity Lithium Ion capacitor with pre-doped Lithium Ions. It offers high operating voltages and high energy density, as well as rapid charge/discharge and a long cycle life, making it useful in a wide range of business fields.

ULTIMO™ is our registered trademark and it means "ultimate" or "improved performance."

1. On Safety in Use

This product is charged to voltage within the range of its specifications at the time of shipment. Misuse will result in electric shock or injury. Damage or puncture of the unit will cause heat, smoke, explosion, or ignition.

It is the responsibility of the user of the ULTIMO™ to read and understand this manual prior to use of the ULTIMO™. A person with electrical safety experience and training should provide further instruction on the specific application of the ULTIMO™ after reviewing the electrical hazards associated with the ULTIMO™. Items such as the location, environment and application should be reviewed and a determination of the extra safety precautions should established prior to the installation or operation of the ULTIMO™ in each specific use application. If any abnormal situation occurs, stop using the product immediately and contact us.

Danger

Do not disassemble, alter, puncture or damage the ULTIMO™

- Doing so may result in electric shock or injury. Damage to the unit may result in heat, smoke, explosion, or ignition.

Do not heat the product or expose it to open flame

- Doing so may result in smoke, explosion, or ignition.

Do not strike, bend, fold or step on the ULTIMO™

- Doing so may result in heat, smoke, explosion, or ignition.

Wear a protective gear such as insulated gloves when handling the conductive terminals.

- Failure to do so may result in electric shock, burn, or injury.

Warning

Do not short-circuit the terminals.

- Doing so may result in electric shock, burn, or injury, and may also lead to a unit breakdown with liquid leakage, heat, smoke, explosion, or ignition.
- Pay special attention to short-circuiting when using a metal tool.

Do not use the product outside the range of its voltage specification.

- Using the product at a voltage outside the specification may shorten its life, and may lead to liquid leakage, heat, smoke, explosion, or ignition.

Do not carry ULTIMO™ by the terminals.

- Doing so may result in electric shock, internal short-circuiting, liquid leakage, or unit breakdown.

Do not install or store the product in a hot or humid place, or a location exposed to direct sunlight for long periods of time.

- Doing so may result in internal short-circuiting, liquid leakage, and unit breakdown.

Do not subject ULTIMO™ to excessive shock or vibration.

- Doing so may result in internal short-circuiting, liquid leakage, and unit breakdown.

Do not put ULTIMO™ on an electromagnetic cooking device, or in a microwave oven or a high-pressure container.

- Doing so may result in liquid leakage, explosion, or unit breakdown.

If liquid leakage, odor, smoke, deformation, gas release valve actuation or other abnormal situations occur, stop using the product immediately.

Should leaking liquid enter your eyes, do not rub your eyes. Rinse them well with tap water (clean water) and see a doctor immediately. Should you swallow the contents, rinse your mouth with water, and see a doctor immediately.

Caution

ULTIMO™ has polarity (plus and minus). **Use the correct polarity**

- Incorrect use of polarity may result in liquid leakage, heat, smoke, explosion, or ignition.

When connecting connectors and electric wires to terminals, **follow the general precautions for handling electricity**.

- Failure to do so may result in liquid leakage, heat, smoke, explosion, or ignition.

Use the correct connectors and electrical wires for the working electric current.

- Use of incorrect connectors and electrical wires may result in heat or ignition.

If the voltage of a connected device is lower than that of ULTIMO™, excessive electric current may flow from ULTIMO™ upon turning on the power.

Should leaking liquid stains the clothes, rinse it away immediately with tap water (clean water).

Upon receiving your product, please make sure there is no deformation, liquid leakage, odd odor, heat, or any other abnormal condition. Should you find any abnormal condition upon receiving the product, please do not use it. Contact us immediately.

2. Environmental Requirements for Usage and Storage Locations

	CLN1100S1A	CLN2200S2A	CLP2200S2A	CLQ1100S1A	CLQ2200S2A
(1) Operating temperature range	-20 to 70 degrees Celsius			-30 to 70 degrees Celsius	
(2) Storage temperature range	-30 to 80 degrees Celsius			-40 to 80 degrees Celsius	
(3) Long-term storage temperature range (recommend)	0 to 35 degrees Celsius				
(4) Operating humidity range	90% Rh or less (non-condensing)				
(5) Storage humidity range	90% Rh or less (non-condensing)				

For storage of longer periods of time, do not store the unit outside the specified voltage which is over 3.8V as the maximum and below 2.2V as minimum.

When using or storing the product, do not subject it to high temperature, direct sunlight, a stove or other heat sources, high humidity, condensation, water, snow, ice or freezing conditions. In addition, do not use or store the product under the following conditions:

(1) Water or oils.
(2) Gaseous oil ingredients
(3) Salt water, or air filled with salt
(4) Acidic or alkaline solvents
(5) Toxic gases (hydrogen sulfide, sulfurous acid, nitrous acid, chloride, bromine, methyl bromide)
(6) Vibration or shock

For long-term storage, pack the unit using materials that protect it from breakage due to stacking weight, and ensure individual insulation of ULTIMO™ to prevent short-circuiting the terminals.

3. Cautions for ULTIMO™ Handling

Do not damage or puncture the ULTIMO™ unit.

- Doing so may result in electrification, injury, heat, smoke, explosion, or ignition.

Do not short-circuit the positive and negative electrodes.

- Doing so may result in electric shock, burn, or injury, and may lead to unit breakdown with liquid leakage, heat, smoke, explosion, or ignition.
- Be particularly careful of short-circuiting when using metal tools.

Do not discharge at lower than the minimum voltage of 2.2V.
Lowering the ULTIMO™ voltage to less than the minimum voltage generates gas, and may result in liquid leakage or explosion.

Do not overcharge at higher than the maximum voltage of 3.8V.
Exceeding the ULTIMO™ voltage to more than the maximum voltage generates gas, and may result in liquid leakage or explosion. Especially overcharge may swell the unit and such deformation may induce internal short circuit.

Do not apply reverse voltage.
Doing so may result in liquid leakage or generation of gas, leading to explosion.

Do not expose the ULTIMO™ unit or the positive and negative terminals to excessive heat. Doing so may result in degradation of electrical characteristics as well as degradation in air-tightness due to softening or deformation, or increased internal pressure due to gas generation, leading to liquid leakage, short-circuiting, or abnormal outer appearance.

Do not use excessive force when handling the positive and negative terminals. Doing so may result in bent or warped terminals, leading to degradation in air-tightness, or increased internal pressure due to gas generation, which may cause liquid leakage, short-circuiting, or abnormal outer appearance.

Do not use excessive force when handling the unit, do not puncture or damage the unit. Doing so may result in degradation in air-tightness, or increased internal pressure due to gas generation, leading to liquid leakage, short-circuiting, or abnormal outer appearance.

4. Precautions on the Devices Using ULTIMO™

4.1 Use at Rated-Voltage and within the Specification Temperatures

Misuse may result in explosion due to liquid leakage, heat, and gas generation.
Do not use this product at a voltage or temperature beyond the specification range. (CLN1100S1A,CLN2200S2A,CLP2200S2A/-20℃～70℃,CLQ1100S1A,CLQ2200S2A/-30℃～70℃)

About cooling ULTIMO™
The temperature of ULTIMO™ might go beyond the specification, depending on the usage conditions (ambient temperature, charging/discharging current value, or charging/discharging frequency). Do not allow the temperature of the unit to go beyond specification, secure plenty of space for heat release. Use a forced-air cooling device such as a cooling fan, as necessary.

Operating ULTIMO™ below its minimum voltage may generate gas and result in liquid leakage or breakage of the unit. Do not use ULTIMO™ below the minimum voltage.

Operating ULTIMO™ above its maximum voltage may generate gas and result in liquid leakage or breakage of the unit. Do not use ULTIMO™ above the maximum voltage.

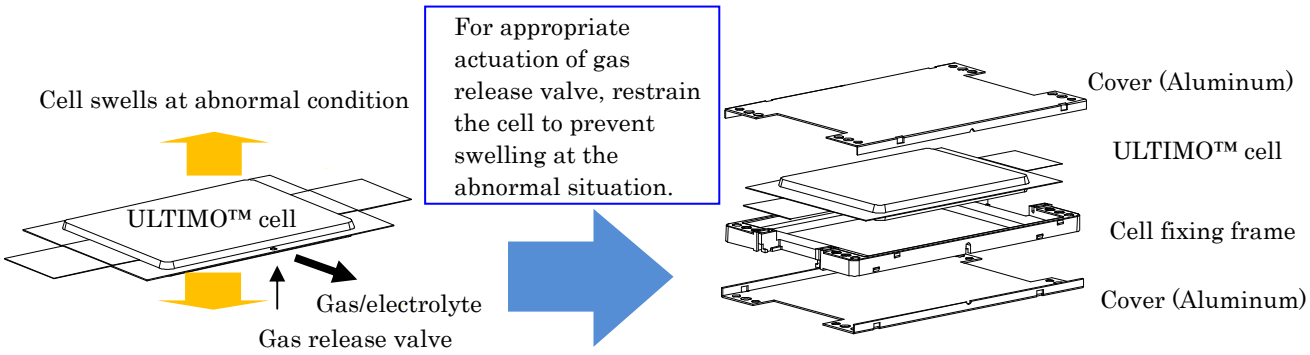
4.2 About Polarity

ULTIMO™ has positive and negative polarities.

Do not connect in reverse. Doing so may result in explosion due to liquid leakage or gas generation, which may lead to ignition and fire.

4.3 Recommendation of ULTIMO™ fixation for appropriate gas release valve actuation

There is a possibility of accident such as liquid leakage, puncture of cell by gas generation which may result in ignition when abnormal situation occurs such as cell damage by excessive pressure, overcharge or over discharge. To prevent such accident as much as possible, ULTIMO™ is carrying gas release valve. To actuate this gas release valve appropriately, it is recommended to fix the cell under restrained condition as described below. To improve safeness, such fixation gives appropriate gas release valve actuation which leaked liquid/generated gas evolve through/around the valve at the abnormal situations. Still there is a possibility of rupture other than gas release valve at some current/restrain conditions, it is recommended to design your product to minimize the influence of leaked liquid or generated gas at the abnormal situation.



Example of cell fixation

4.4 About Using ULTIMO™ with a Device with Safety Concerns

Every effort has been made to ensure quality. In case your device were put under an abnormal environmental condition or the device got some trouble or fault, however, faulty liquid leakage, internal short-circuit, or some other failure may occur for ULTIMO™ followed by internal out-gassing, unit swelling, or unit deformation. In particular, if the unit got overly charged, the unit swelling is likely to happen and may result in internal short-circuit. Design the housing to prevent ULTIMO™ deformation and internal short circuit by using unit-binding structure. Review the following precautionary items to ensure safety with a fail-safe design.

If damage to the unit or danger to human life may be expected due to a problem in transportation vehicles and equipment (trains, automobiles, and traffic signals), aircraft, space vehicles, electric heating equipment, combustion and gas equipment, rotating equipment, disaster and crime prevention equipment, and medical equipment, do the following:

(1) Install a protection circuit and protection device to make the system safer.

(2) Install redundant circuits, so that a single failure will not render the unit unsafe.

(3) Design the housing to prevent ULTIMO™ deformation and internal short circuit by using unit-binding structure.

4.5 About the Life of ULTIMO™

The life characteristics of this product vary depending on the usage condition. Consider long-term changes in characteristics when designing devices to ensure device safety.

4.6 Use of ULTIMO™ under High Current

Upon use of ULTIMO, it generates heat by Joule heat of its internal resistance. At high current application, internal temperature of ULTIMO could exceed operational temperature if heat radiation is not taken into account. Effective cooling structure must be considered to maintain internal cell temperature within operational temperature range.

Do not discharge higher than maximum discharge current (CLN1100S1A/300A, CLN2200S2A/600A, CLP2200S2A/850A, CLQ1100S1A/800A, CLQ2200S2A/1350A）.

The maximum discharge current is defined as the current that a fully charged cell can discharge for 1 second at 25ºC estimated from the data up to 480A test.

Do not flow maximum discharge current continuously, because the use at the maximum discharge current accompanies large heat even at a short period.

4.7 Precautions for Using Multiple ULTIMO™ Units

When using multiple units of ULTIMO™, use the same voltage for each unit.

If you use the units in series, design a system that balances the voltages.

Situate the unit so that an accidental leakage of electrolyte from ULTIMO™ will not affect the devices around it.

ULTIMO™'s voltage is "approximately 3.0V" when shipped. If you use multiple units of ULTIMO™ after a long period of non-use after purchase, align each unit's voltage before use.

Do not use different models of ULTIMO™ together.

5. About Maintenance

Equipment using ULTIMO™ units should be maintained on a regular basis. Perform the following checks:

(1) ULTIMO™ unit outer appearance: Check for distinctive abnormal conditions such as deformation and liquid leakage

(2) ULTIMO™ unit electrical performance: Check the items listed in the catalog or the specifications at delivery

Should you find an abnormal condition, stop using the unit. Replace parts and take other appropriate actions.

6. About Transportation

Do not subject ULTIMO™ to excessive shock or vibration during transit.

Do not drop or pierce the package during transport.

Pack with a material strong enough to withstand the weight of the stacks.

When packing, make sure each unit is properly insulated to prevent short-circuiting between terminals.

Do not get the units wet by exposing them during transit to rainwater, ocean water, snow ice, condensation, or freezing conditions.

Make sure that the ULTIMO™ voltage will not go outside the specification range during transit.

Regulations for Air Transport

Currently, ULTIMO™ is not classified as a hazardous material under the 2011 IATA regulation. However, air transport regulations may change. You should check the latest transport regulations to ensure the correct means of packaging and transportation.

7. In an Emergency

Immediately stop using ULTIMO™ should you notice deformation, breakage, or excessive rise in the temperature, and replace or reclaim the unit.

If ULTIMO™ leaks liquid or emits odor, immediately stop using it and move it away from fire, as the leaking electrolyte may ignite.

8. About Disposal

Dispose of used ULTIMO™ units in compliance with all local, state and federal laws. User should contact an industrial waste provider for correct disposal.

9. About Warranty

"10. Specifications. (Typical value)" described hereafter is not a guaranteed values, only specified as reference purpose. Our product warranty is applied when you have followed the instructions in this User's Manual in the use and storage of this product. We guarantee that the product meets the specifications that we have separately presented to you or that have been contracted otherwise. We are not responsible for any damage caused due to use or storage not in accordance with the instructions of this Manual. We do not guarantee that the product will fit your particular usage needs. Check the suitability at your own risk.

We are not responsible for any cases where products that include ULTIMO™ infringe upon patents or other intelligent property rights due to the way ULTIMO™ is utilized in those products in the course of manufacturing using ULTIMO™, the specifications of those products, or the regulations of the countries/regions to which ULTIMO™ has been shipped.

Contact us at the following address and phone if you have questions regarding this Manual.

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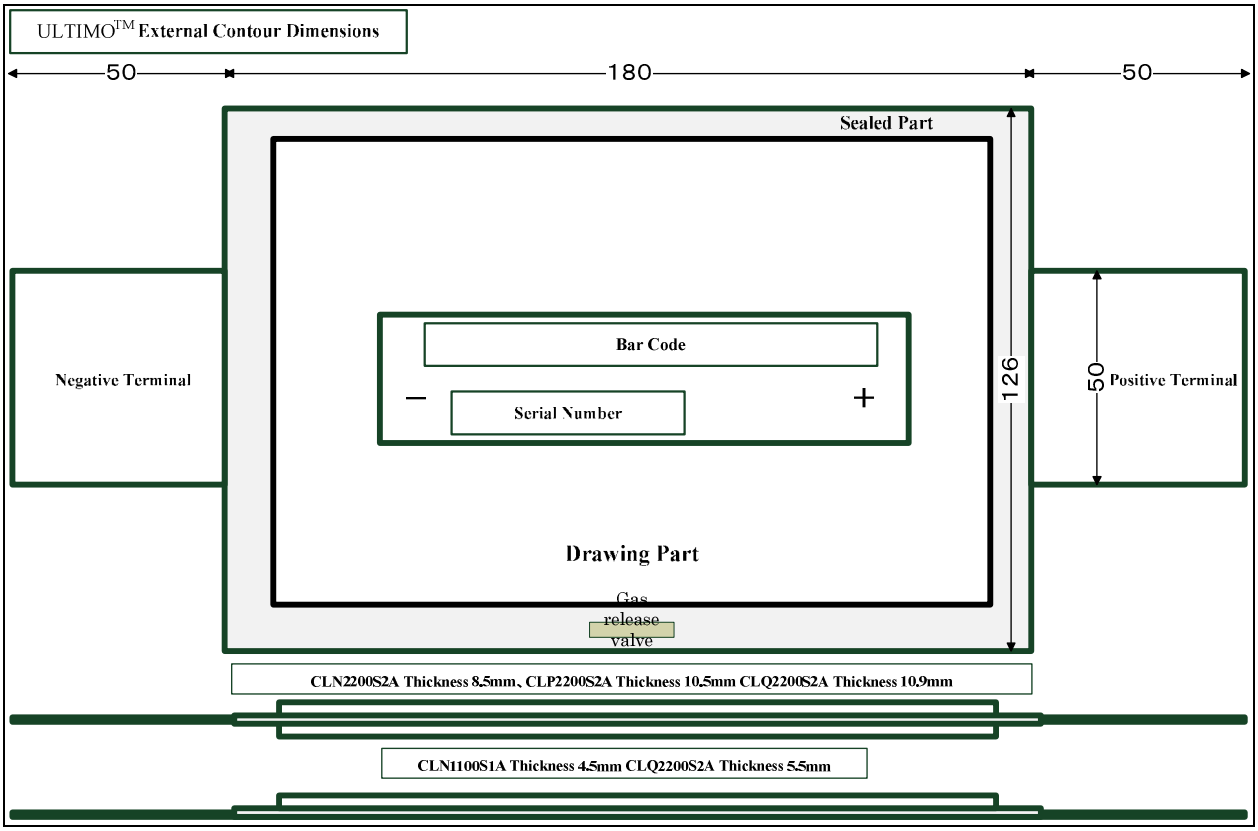
10. Specifications (Typical values)

	Item of Evaluation			Unit	Standard		Low Resistance	Ultra Low Resistance		Conditions
					CLN1100S1A	CLN2200S2A	CLP2200S2A	CLQ1100S1A	CLQ2200S2A	
1	Range of operating temperatures			℃	-20 to 70	-20 to 70	-20 to 70	-30 to 70	-30 to 70	
2	Rated voltage		Maximum voltage	V	3.8	3.8	3.8	3.8	3.8	
			Minimum voltage	V	2.2	2.2	2.2	2.2	2.2	
3	Initial characteristics		Capacitance	F	1100	2200	2200	1100	2200	*1 Reference
			ESR	mΩ	2.8	1.4	1.0	0.8	0.5	1KHz,3.0V
			DC-IR	mΩ	4.5	2.3	1.4	1.2	0.7	*1 Reference
			Weight E density	Wh／kg	12	14	11	10	10	
			Volume E density	Wh／L	21	25	19	19	19	
4	Temperature characteristics	-20℃	Capacity ratio at 25 degrees Celsius	%	75	75	75	90	90	*2 Reference
		70℃	Capacity ratio at 25 degrees Celsius	%	105	105	105	100	100	
5	High-temperature load characteristics		Initial capacity ratio	%	90	90	90	100	100	3.8V、70 degrees Celsius,1000h
6	Cycle characteristics		Initial capacity ratio	%	90	90	90	>95	>95	*3 Reference
7	Self-discharge characteristics		Voltage reduction	%	<5	<5	<5	<5	<5	3 months,25 degrees Celsius
8	Cell size			mm	180*126*4.5	180*126*8.5	180*126*10.5	180*126*5.5	180*126*10.9	Without terminals

*1 CLN1100S1A,CLQ1100S1A／5A constant current discharge,25 degrees Celsius、CLN2200S2A,CLP2200S2A,CLQ2200S2A／10A constant current discharge,25 degrees Celsius
*2 CLN1100S1A,CLQ1100S1A／5A constant current discharge、CLN2200S2A,CLP2200S2A,CLQ2200S2A／10A constant current discharge
*3 CLN1100S1A／50A constant current charge/discharge,25 degrees Celsius 100k cycle
CLN2200S2A,CLP2200S2A,CLQ1100S1A／100A constant current charge/discharge,25 degrees Celsius 100k cycle
CLQ2200S2A／200A constant current charge/discharge,25 degrees Celsius 100k cycle

11. External Contour Dimensions



Specifications and external contour dimensions may change without prior notice. Please check with us at the time of use.

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