

PRODUCT SAFETY INFORMATION (SDS)

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1. Product and Company Identification

Name of product : Lithium-Ion battery

Model name : G9600-F4010

Manufacturer Name of Company : TOYOTA MOTOR CORPORATION
Address : 1, Toyota-cho, Toyota, Aichi, 471-8571 JAPAN
Telephone number : +81-565-28-2121
Facsimile number : +81-565-94-3319
Department : EHV Battery Design Div.
Representative : Kousuke Suzui

Product information Rated voltage : 355.2 (V)
Watt-hour rating : 54.3 (kWh)
Mass : 415 (kg)

This product consists of a sub-battery of UN 38.3 compliant model G9601-10010, G9601-F4010
The battery assembly has over 6.2kWh with external short circuit, overcharge, overdischarge, overheat protection function.

2. Components / Information on Ingredients

The batteries consist of hermetically sealed lithium ion cells named as follows.

There is no component or material which is classified as dangerous goods other than the cells.

Part	Material name	Amount
Battery cell	Model name ; UF261591TA Manufacturer ; Industrial Solutions Company, Panasonic Corporation	250kg
	Electrolyte	Organic electrolyte mainly composed of alkyl carbonate 28L
Others	Iron	110kg
	Copper	7kg
	Aluminium	8kg
	Plastic and others	40kg

3. Transportation Information

- UN Number : 3480
- Proper Shipping Name : Lithium ion batteries

- Hazard Classification : Class 9 Miscellaneous
 - Information of adaptation to UN Model Regulations, Manual of Tests and Criteria §38.3.
 - Test condition: Manual of Tests and Criteria Rev. 6
 - Battery assembly: Conformed
 - Battery cell built in the assembly: Conformed
 - In the case of transportation, the following regulations should be taken into consideration.
 - UN Model Regulations Rev. 20 (2017)
 - ICAO Technical Instructions 2019/2020 Edition
 - IATA Dangerous Goods Regulations 60th Edition
 - IMDG code 2018 Edition (Amendment 39-18)
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4. Precaution for Handling and Storage

- This product stores high voltage electricity at over 100 V. To prevent serious injury or death from severe burns or electric shock, follow the precautions listed below.
 - 1) Do not remove the cover of battery assembly.
 - 2) Do not touch the high voltage components inside. Wear appropriate protective equipment such as insulated gloves when there is a risk of touching.
 - The batteries are recommended to be charged to about 30—50% of capacity, then stored at room temperature.
 - Do not store the battery in places of the high temperature or under direct sunlight for a long time or in front of a stove. Please also avoid the places of high humidity. Be sure not to expose the battery to condensation, water drop.
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5. Measures for electrolyte leakage from the battery

- The Li-ion battery electrolyte is a flammable organic electrolyte that is damaging to human tissues.
 - The electrolyte is absorbed into the battery cell separators, even if the battery cells are crushed or cracked, it is unlikely that liquid electrolyte will leak.
 - Any liquid electrolyte that leaks from a Li-ion battery cell quickly evaporates. Only a small amount may leak from the batteries which may irritate the eyes, nose, throat, and skin.
 - Contact with the vapor produced by the electrolyte may irritate the nose and throat.
 - To avoid injury caused by coming in contact with the electrolyte or vapor, wear appropriate protective equipment such as rubber gloves, safety goggles, protective mask or SCBA when there is a risk of touching electrolyte.
 - If the electrolyte spills, keep it away from fire and ensure the area is well ventilated. Absorb the electrolyte with a waste cloth or equivalent absorbing material, and keep it in an airtight container until disposed of.
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6. Fire Fighting Measures

- Extinguish the fire with copious amounts of water to cool down the high voltage battery.
- To avoid serious injury or death from severe burns or electric shock, never breach or remove the high voltage battery assembly cover under any circumstances, including fire.
- If only a small amount of water is used to extinguish a fire, a short circuit may occur in the high voltage battery, causing the fire to reignite.
- It is recommended to allow the high voltage battery to burn itself out if it is judged that it is difficult to apply copious amounts of water to the high voltage battery.
- Burning Li-ion batteries may irritate the eyes, nose, and throat.
- Contact with the vapor produced by the electrolyte may also irritate the nose and throat.
- To avoid injury by coming in contact with the electrolyte or vapor, wear appropriate protective equipment such as rubber gloves, safety goggles, protective mask or SCBA when there is a risk of touching electrolyte.

Safety data sheet for chemical products (SDS)

1. PRODUCT AND COMPANY IDENTIFICATION

- Product name: HEV Lithium Ion Battery Cell
- Product code: Prismatic type cell
UF261591TA

- * Company name: Prime Planet Energy & Solutions, Inc.
- * Address: 194-4, Tokonabe-cho, Kasai-shi, Hyogo, Japan
- * Telephone number: +81-50-9945-9325
- * Telefax number: +81-790-43-2096
- * Emergency telephone number: [All day] +81-790-43-2109

2. COMPOSITION / INFORMATION ON INGREDIENTS

- * Substance or Mixture: Mixture
- * Information about the chemical nature of product:

Common chemical name / General name	CAS number	NIOSH / RTECS number	Concentration / Concentration range
Lithium Metal Oxide	182442-95-1	Not listed	30-40%
Aluminum	7429-90-5	BD0330000	10-20%
Graphite	7782-42-5	FF5250100	15-25%
Copper	7440-50-8	GL5325000	5-15%
Organic electrolyte	21324-40-3 96-49-1 623-53-0 616-38-6	Not listed FF9550000 Not listed FG0450000	10-20%

3. HAZARDS IDENTIFICATION

For the battery cell, chemical materials are stored in a hermetically sealed Aluminum case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, there is no physical danger of ignition or explosion and chemical danger of hazardous materials' leakage.

However, if exposed to a fire, added mechanical shocks, decomposed, added electric stress by miss-use, the battery cell case will be breached at the extreme, hazardous materials may be released. Therefore, addition of electrolyte is forbidden after sealing the battery cell to maintain sealability.

Moreover, if heated strongly by the surrounding fire, acrid gas may be emitted.

- Most important hazard and effects

Human health effects:

Inhalation: The steam of the electrolyte has an anesthesia action and stimulates a respiratory tract.

Skin contact: The steam of the electrolyte stimulates a skin. The electrolyte skin contact causes a sore and the stimulation on the skin.

Eye contact: The steam of the electrolyte stimulates eyes. The electrolyte eye contact causes a sore and the stimulation on the eye. Especially, substance that causes a strong inflammation of the eyes is contained.

Environmental effects: Since a battery cell remains in the environment, do not throw it into the environment.

- Specific hazards:

If the electrolyte contacts with water, it will generate detrimental hydrogen fluoride.

Since the leaked electrolyte is flammable liquid, do not bring close to fire.

4. FIRST-AID MEASURES

Internal cell materials of an opened battery cell

- * Inhalation: Make the victim blow his/her nose, gargle. Seek medical attention if necessary.
- * Skin contact: Remove contaminated clothes and shoes immediately. Wash extraneous matter or contact region with soap and plenty of water immediately.

- Eye contact: Do not rub one's eyes. Immediately flush eyes with water continuously for at least 15 minutes. Seek medical attention immediately.

5. FIRE-FIGHTING MEASURE

- Suitable extinguishing media: Plenty of water, carbon dioxide gas, nitrogen gas, chemical powder fire extinguishing medium and fire foam.
- Specific hazards: Corrosive gas may be emitted during fire.
- Specific methods of fire-fighting: When the battery burns with other combustibles simultaneously, take fire-extinguishing method which correspond to the combustibles. Extinguish a fire from the windward as much as possible.
- Special protective equipment for firefighters:
 - Respiratory protection: Respiratory equipment of a gas cylinder style or protection-against-dust mask
 - Hand protection: Protective gloves
 - Eye protection: Goggle or protective glasses designed to protect against liquid splashes
 - Skin and body protection: Protective cloth

6. ACCIDENTAL RELEASE MEASURES

Spilled internal cell materials, such as electrolyte leaked from a battery cell, are carefully dealt with according to the followings.

- Precautions for human body: Remove spilled materials with protective equipment (protective glasses and protective gloves). Do not inhale the gas as much as possible. Moreover, avoid touching with as much as possible.
- Environmental precautions: Do not throw it into the environment.
- Method of cleaning up: The spilled solids are put into a container. The leaked place is wiped off with dry cloth.
- Prevention of secondary hazards: Avoid re-scattering. Do not bring the collected materials close to fire.

7. HANDLING AND STORAGE

* Handling

Technical measures

Prevention of user exposure: Not necessary under normal use.

Prevention of fire and explosion: Not necessary under normal use.

Specific safe handling advice: Never throw cells in a fire or expose to high temperatures. Do not soak cells in water and seawater. Do not expose to strong oxidizers. Do not give a strong mechanical shock or fling. Never disassemble, modify or deform. Do not connect each of the positive terminal and the negative terminal and the battery cell case with electrically conductive material. In the case of charging, charge according to the conditions specified by Sanyo.

* Storage

Technical measures

Storage conditions (suitable, to avoid): Avoid direct sunlight, high temperature, high humidity. Store in cool place (temperature: -20 ~ 35 degree C, humidity: 45 ~ 85%).

Incompatible products: Conductive materials, water, seawater, strong oxidizers and strong acids

Packing material (recommended, not suitable): Insulative and tearproof materials are recommended.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

* Engineering measures:

No engineering measure is necessary during normal use. In case of internal cell materials' leakage, operate the local exhaust or improve ventilation.

* Control parameters

Common chemical name / General name	OSHA	ACGIH	
	PEL-TWA	TLV-TWA	BEI
Lithium Metal Oxide	Not listed	Not listed	Not listed
Aluminum	15 mg/m ³ (as total dust) 5 mg/m ³ (as respirable fraction)	10 mg/m ³ (as total dust)	Not listed
Graphite	15 mg/m ³ (as total dust)	2mg/m ³ (as inhalation coarse particulate)	Not listed

Copper	1 mg/m ³ (as dust, mist) 0.1 mg/m ³ (as fume)	1 mg/m ³ (as dust, mist) 0.2 mg/m ³ (as fume)	Not listed
Organic electrolyte	Not listed	Not listed	Not listed

OSHA: Occupational Safety and Health Administration

PEL-TWA: Permissible Exposure Limit-Time Weighted Average concentration

ACGIH: American Conference of Governmental Industrial Hygienists, Inc.

TLV-TWA: Threshold Limit Value-Time Weighted Average concentration

BEI: Biological Exposure Indices

- * Personal protective equipment
 - Respiratory protection: Respirator with air cylinder, dust mask
 - Hand protection: Protective gloves
 - Eye protection: Goggle or protective glasses designed to protect against liquid splashes
 - Skin and body protection: Working clothes with long sleeve and long trousers

9. PHYSICAL AND CHEMICAL PROPERTIES

- * Appearance
 - Physical state: Solid
 - Form: Prismatic
 - Color: Metallic color
 - Odor: No odor
- * pH: NA
- * Specific temperatures/temperature ranges at which changes in physical state occur.
There is no useful information for the product as a mixture.
- * Flash point: NA
- * Explosion properties: NA
- * Density: NA
- * Solubility ,with indication of the solvent(s): Insoluble in water

10. STABILITY AND REACTIVITY

- * Stability: Stable under normal use
- * Hazardous reactions occurring under specific conditions
 - * Conditions to avoid: When a battery cell is exposed to an external short-circuit, crushes, modification, high temperature above 100 degree C, it will be the cause of heat generation and ignition. Direct sunlight and high humidity.
 - * Materials to avoid: Conductive materials, water, seawater, strong oxidizers and strong acids.
 - * Hazardous decomposition products: Acrid or harmful gas is emitted during fire.

11. TOXICOLOGICAL INFORMATION

There is no data available on the product itself. The information of the internal cell materials is as follows.

Lithium Metal Oxide

- Acute toxicity: Unknown
- Local effects: Unknown
- Sensitization: Unknown
- Chronic toxicity/Long term toxicity: Unknown
- Skin causticity: Unknown

Aluminum

- Health Rating:0 - None
- Flammability Rating:1 - Slight
- Reactivity Rating:1 - Slight
- Contact Rating:0 - None
- Local effects: Aluminum itself has no toxicity.

Graphite

- Health Rating:0 - None
- Flammability Rating:0 - None
- Reactivity Rating:0 - None

- Contact Rating:1 - Slight
- Acute toxicity: Unknown.
- Local effects: When it goes into one's eyes, it stimulates one's eyes; conjunctivitis, thickening of corneal epithelium or edematous inflammation palpebra may be caused.
- Chronic toxicity/Long term toxicity: Since the long-term inhalation of high levels of graphite coarse particulate may become a cause of a lung disease or a tracheal disease, it is regulated by the coarse particulate obstacle prevention rule and the dust-lung method enforcement regulations.
- Carcinogenicity: Graphite is not recognized as a cause of cancer by research organizations and natural toxic substance research organizations of cancer.

Copper

- Health Rating:3 - Severe (Life)
- Flammability Rating:1 - Slight
- Reactivity Rating:2 - Moderate
- Contact Rating:1 - Slight
- Acute toxicity:
 - 60-100mg sized coarse particulate causes a gastrointestinal disturbance with nausea and inflammation.
 - TDL_o, hypodermic - Rabbit 375mg/kg
- Local effects:
 - Coarse particulate stimulates a nose and a tracheal.
 - When it goes into one's eyes, the symptom of the reddening and the pain is caused.
- Sensitization: Sensitization of the skin may be caused by long-term or repetitive contact.
- Reproductive toxicity: TDL_o, oral - Rat 152mg/kg

Organic electrolyte

- Acute toxicity: LD₅₀, oral - Rat 2,000mg/kg or more
- Local effects: Unknown.
- Skin irritation study: Rabbit - Mild
- eye irritation study: Rabbit - Very severe

12.ECOLOGICAL INFORMATION

- * Persistence/degradability: Since a battery cell and the internal materials remain in the environment, do not bury or throw it into the environment.

13.DISPOSAL CONSIDERATIONS

- * Recommended methods for safe and environmentally preferred disposal:

Product(waste from residues)

Dispose used cells according to the law of the countries.

Contaminated packaging

Neither a container nor packing is contaminated during normal use. When internal materials leaked from a battery cell contaminates, dispose the packaging according to the law of the countries.

14.TRANSPORT INFORMATION

- * The UN classification number: Class 9 3480



Each cell is of the type proved to meet the requirement of each test of the UN Manual of Tests and Criteria, Part III, Sub-section 38.3, and may be transported under each condition below.

- 1) PACKING INSTRUCTION 965 section IA of IATA-DGR
- 2) Special Provision 230 of IMDG-Code, and PACKING INSTRUCTION P903 of IMDG-Code
- 3) Special Provision 230 of ADR, and PACKING INSTRUCTION P903 of ADR
- 4) 49 CFR 173.185

If battery containing these cells is of the type proved to meet the requirement of each test of the UN Manual of Tests and Criteria, the battery may be transported under each condition below.

- 1) PACKING INSTRUCTION 965 section IA of IATA-DGR
- 2) Special Provision 230 of IMDG-Code, and PACKING INSTRUCTION P903 of IMDG-Code
- 3) Special Provision 230 of ADR, and PACKING INSTRUCTION P903 of ADR
- 4) 49 CFR 173.185

If battery containing these cells has not been tested in accordance with the requirements contained in the UN Manual of Tests and Criteria, the battery may be transported under each condition below in case the battery is prototype for testing.

- 1) Special Provision A88 of IATA-DGR
- 2) Special Provision 310 of IMDG-Code
- 3) Special Provision 310 of ADR
- 4) 49 CFR 173.185(e)

In the case of transportation, avoid exposure to high temperature and prevent the formation of any condensation. Take in a package of them without falling, dropping and breakage. Prevent collapse of package piles and wet by rain. The container must be handled carefully. Do not give shocks that result in a mark of hitting on a cell. Please refer to Section 7-HANDLING AND STORAGE also.

15. REGULATORY INFORMATION

- Regulations specifically applicable to the product:
 - IATA UN No.3480 (air transportation)
 - IMO UN No.3480 (sea transportation)
 - Occupational Safety and Health Administration requirements [USA]
 - Toxic Substances Control Act [USA]
 - Wastes Management and Public Cleaning Law [Japan]
 - Law for Promotion of Effective Utilization of resources [Japan]

16. OTHER INFORMATION

- * The information contained in this Safety data sheet is based on the present state of knowledge and current legislation.
- * This safety data sheet provides guidance on health, safety and environmental aspects of the product and should not be construed as any guarantee of technical performance or suitability for particular applications.

* Reference

Chemical substances information: Japan Advanced Information center of Safety and Health
Occupational Safety and Health Administration (OSHA): U.S. Department of Labor (DOL)
Toxic Substances Control Act: U.S. Environmental Protection Agency (EPA)
International Chemical Safety Cards (ICSCs): International Occupational Safety and Health Information Centre (CIS)
2008 TLVs and BEIs: American Conference of Governmental Industrial Hygienists (ACGIH)
Dangerous Goods Regulations – 61st Edition Effective 1 January 2020: International Air Transport Association (IATA)
IMDG Code – 2018 Edition: International Maritime Organization (IMO)
Manual for Transport of Lithium/Lithium Ion Batteries - 2019 Edition: Battery Association of Japan (BAJ)
RTECS(CD-ROM)
MSDS of raw materials prepared by the manufactures

First edition : Jun. 27 2008

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