Rechargeable Lithium Ion Batteries: Tesla Products

The products referenced herein are exempt articles and are not subject to OSHA's Hazard Communication Standard requirements for preparation of Safety Data Sheets (SDS).

SDS

Safety Data Sheets (SDS) are a sub-requirement of the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR Subpart 1910.1200. This Hazard Communication Standard does not apply to various subcategories including anything defined by OSHA as an “article.” OSHA has defined “article” as a manufactured item other than a fluid or particle; (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities (e.g., minute or trace amounts) of a hazardous chemical, and does not pose a physical hazard or health risk to employees.

Tesla battery products meet the OSHA definition of “article.” Thus, they are exempt from the requirements of the Hazardous Communication Standard therefore, a SDS is not required.

1. Identification of Products and Company

Product	Rechargeable lithium-ion Powerpack Systems and Powerwalls for residential, commercial, and industrial Tesla applications, and modules and sub-assemblies that can be installed in Powerpack Systems and Powerwalls (Tesla Energy Products). Specific part numbers are listed below.	
Locations	**Headquarters (USA)**	3500 Deer Creek Road Palo Alto, CA 94304 Tel. No. +001 650-681-5000
	Europe and Africa	Burgemeester Stramanweg 122 1101EN Amsterdam The Netherlands Tel. No. +31 20 258 3916
	Australia and Asia	Eastern Aoyama Building 4F 8-5-41 Akasaka, Minato-ku Tokyo, Japan 107-0052 Tel: +81 3 6890 7700
	Manufacturer (USA)	3500 Deer Creek Road Palo Alto, CA 94304 Tel. No. +001 650-681-5000
Emergency Contacts	**CHEMTREC**	For Hazardous Materials [or Dangerous Goods] Incidents: Spill, Leak, Fire, Exposure, or Accident Call CHEMTREC Day or Night Within USA and Canada: 1-800-424-9300 Contract Number: CCN204273 Outside USA and Canada: +1 703-741-5970 (collect calls accepted)

LITHIUM-ION BATTERY EMERGENCY RESPONSE GUIDE
Tesla Powerpack System, Powerwall, and Subassemblies, All Sizes

Tesla Powerpack Systems and Powerwalls contain battery subassemblies made up of rechargeable lithium-ion cells. Tesla Powerpack Systems and Powerwalls and their respective battery subassemblies are covered by this document (Tesla Energy Products).

Tesla Energy Products contain sealed lithium-ion battery cells (cells) that are similar to rechargeable batteries in many consumer electronic products. Cells are individually, hermetically sealed cylinders approximately 18-21 mm in diameter and 65-70 mm in length. These cylinders each contain lithium-ion electrodes and electrolyte (approximate composition listed below). THE CELLS AND BATTERIES DO NOT CONTAIN METALLIC LITHIUM. Individual cells have nominal voltages of approximately 3.6 V.

Materials/Ingredients of Battery Cells	Approx. % by wt.
The lithium-ion cell positive electrodes can be composed of: Lithium Nickel Cobalt Aluminum Oxide (NCA material), $LiNi_xCo_yAl_zO_2$; Lithium Nickel, Manganese, Cobalt Oxide (NMC material) $LiNi_xMn_yCo_zO_2$; Lithium Nickel, Manganese Oxide (NMO material), $LiNi_xMn_yO_2$ Lithium Cobalt Oxide, $LiCoO_2$; or a mixture of these compounds	33
Carbon	21
Iron	12
Copper	7
Aluminum	5
Nickel	<1
Organic electrolyte (mainly composed of alkyl carbonate)*	10
Polypropylene	3
Polyethylene Terephthalate	<1
Other	8

**An acceptable exposure concentration of electrolyte has not been identified by the American Council of Governmental Industrial Hygienists (ACGIH). In case of electrolyte leakage from the battery, the oral (rat) LD50 is greater than 2 g/kg (estimated).*

Tesla Powerpack systems and Powerwalls also include sealed thermal management systems containing coolants and refrigerants.

Non-Cell Materials Found in Powerpack Systems and Powerwalls	Approximate Quantity
Ethylene glycol 50/50 mixture with water	Powerwall 1: 1.6 L of 50/50 mixture Powerwall 2: 2.3 L of 50/50 mixture Powerpack 1: 22 L of 50/50 mixture Powerpack 2: 26 L of 50/50 mixture Tesla Inverter: 11 L of 50/50 mixture
R134a: 1,1,1,2-Tetrafluoroethane refrigerant	Powerwall 1, 2: none Powerpack 1, 2: 400 g

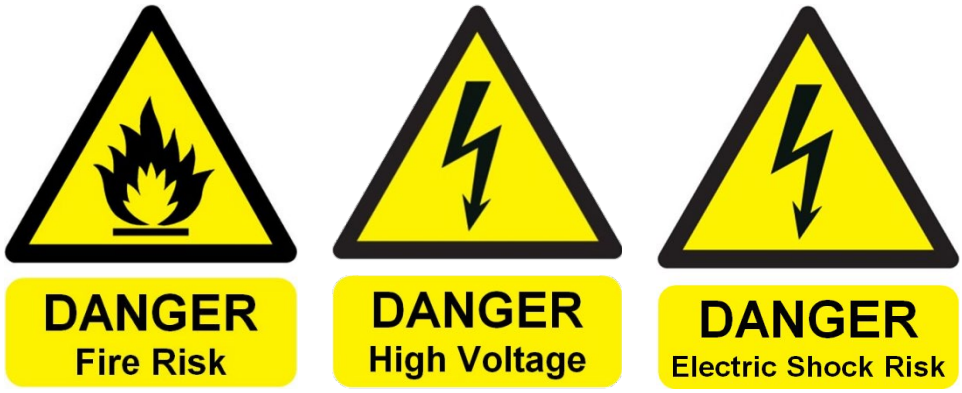
LITHIUM-ION BATTERY EMERGENCY RESPONSE GUIDE
Tesla Powerpack System, Powerwall, and Subassemblies, All Sizes

Individual lithium-ion cells are connected to form modules. Pods are installed in a Powerpack or Powerwall. Approximate specifications of lithium-ion based modules, pods, Powerwalls, and Powerpacks are listed below. Modules and pods are battery sub-assemblies.

Part Number (Reman Number if available)	Description	Voltage – as shipped (V)	Nominal Voltage – as installed (V)	Max Voltage – as installed (V)	Weight (kg)	Height (cm)	Width (cm)	Depth (cm)
Powerwall 1 Versions								
1050100-x*y*-z*	POWERWALL, 2KW, 7KWH	<30 (DC)	400 (DC)	450 (DC)	95 (210 lb)	130 (51 in)	86 (34 in)	18 (7 in)
1067000- x*y*-z*	POWERWALL, 3.3KW, 7KWH	<30 (DC)	400 (DC)	450 (DC)	95 (210 lb)	130 (51 in)	86 (34 in)	18 (7 in)
1068000-x*y*-z*	POWERWALL, 6.6KW, 10KWH	<30 (DC)	400 (DC)	450 (DC)	101 (223 lb)	130 (51 in)	86 (34 in)	18 (7 in)
Powerwall 2 Versions								
1092170-x*y*-z*	AC POWERWALL	<30 (DC)	208, 240, 277 (AC)	300 (AC)	122 (269 lb)	112 (44 in)	74 (29 in)	14 (5.5 in)
1112170-x*y*-z*	DC POWERWALL	<30 (DC)	450 (DC)	550 (DC)	115 (254 lb)	112 (44 in)	74 (29 in)	14 (5.5 in)
Powerpack 1 Versions								
1047404-x*y*-z*	POWERPACK (2hr continuous net discharge)	<30 (DC)	400 (DC)	450 (DC)	1680 (3700 lb)	219 (86 in)	97 (38 in)	132 (52 in)
1060119-x*y*-z*	POWERPACK (4hr continuous net discharge)	<30 (DC)	400 (DC)	450 (DC)	1665 (3670 lb)	219 (86 in)	97 (38 in)	132 (52 in)
1121229-x*y*-z*	POWERPACK (4hr continuous net discharge)	<30 (DC)	400 (DC)	450 (DC)	2160 (4765 lb)	219 (86 in)	97 (38 in)	132 (52 in)
Powerpack 1.5 Version								
1089288-x*y*-z*	POWERPACK 1.5 C/2 SYSTEM	<30 (DC)	900 (DC)	920 (DC)	1622 (3575 lb)	219 (86 in)	131 (51.5 in)	82 (32.5 in)
Powerpack 2 Versions								
1083931-x*y*-z* (1130518-x*y*-z*)	POWERPACK 2,C/4 SYSTEM	<30 (DC)	900 (DC)	920 (DC)	2160 (4765 lb)	219 (86 in)	131 (51.5 in)	82 (32.5 in)
1083932-x*y*-z*	POWERPACK 2,C/2 SYSTEM	<30 (DC)	900 (DC)	920 (DC)	2160 (4765 lb)	219 (86 in)	131 (51.5 in)	82 (32.5 in)

** Note that the 8th or 9th digit could be any number or letter and the 10th digit could be any letter.*

2. Handling and Use Precautions/ Identification of Hazards



The products described by this document are dangerous if mishandled. Injury to property or person, including loss of life is possible if mishandled.

Tesla Energy Products contain lithium-ion batteries. **A battery is a source of energy**. Do not short circuit, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. An internal or external short circuit can cause significant overheating and provide an ignition source resulting in fire, including surrounding materials or materials within the cell or battery. Under normal conditions of use, the electrode materials and electrolyte they contain are not exposed, provided the battery integrity is maintained and seals remain intact. Risk of exposure may occur only in cases of abuse (mechanical, thermal, electrical).

a. High Voltage Hazards

Under normal conditions of use, provided that a Tesla Energy Product enclosure remains closed, handling the product does not pose an electrical hazard. Numerous safeguards have been designed into Tesla Energy Products to help ensure that the high voltage battery is kept safe and secure as a result of a number of expected abuse conditions. All of the constituent component battery cells are sealed within the pack as sub-groups in metal enclosures (Pods). The exterior of each Pod is isolated from internal components and connectors are touch-safe. Pods are then installed in a rigid metal enclosure, which is isolated from high voltage.

A Tesla Energy Product may pose a significant high voltage and electrocution risk if the outer enclosure, Pod enclosures, and/or safety circuits have been compromised or have been significantly damaged. **A battery pack, even in a normally discharged condition is likely to contain substantial electrical charge and can cause injury or death if mishandled.** If a Tesla Energy Product has been significantly visibly damaged or its enclosure compromised, then practice appropriate high-voltage preventative measures until the danger has been assessed (and dissipated if necessary).

WARNING: NEVER CUT INTO A SEALED TESLA ENERGY PRODUCT ENCLOSURE due to the high voltage and electrocution risks.

For proper installation / removal instructions please contact the Tesla Service team:

- PowerpackSupport@tesla.com
- (650) 681-6060

b. Hazards Associated with Mechanical Damage

Mechanical damage to Tesla Energy Products can result in a number of hazardous conditions (discussed below) including:

- Leaked battery pack coolant (see Section 2D)
- Leaked refrigerant (Powerpack systems only see Section 2E)
- Leaked cell electrolyte (see Section 2F)
- Rapid heating of individual cells due to exothermic reaction of constituent materials (cell thermal runaway), venting of cells, and propagation of self-heating and thermal runaway reactions to neighboring cells.
- Fire

To prevent mechanical damage to Tesla Energy Products, these items should be stored in their original packaging when not in use or prior to being installed (see Section 6 below).

c. Hazards Associated with Elevated Temperature Exposure

The Tesla Powerpack system and Powerwall are designed to withstand operating temperatures up to 50°C (122°F), with up to 100% operating humidity (condensing), and storage temperatures up to 60°C (140°F) and <95% relative humidity (non-condensing) for up to 24 hours.

Exposure of Tesla Energy Products to elevated temperatures can drive battery cells into thermal runaway and result in a fire.

- Storage for more than 24 hours at temperatures above approximately 80°C (176°F) could result in cell thermal runaway reactions and should be avoided.
- Storage for more than a few minutes at temperatures above approximately 150°C (302°F) could result in cell thermal runaway reactions and should be avoided.

Exposure of battery packs to localized heat sources such as flames could result in cell thermal runaway reactions and should be avoided.

d. Hazards Associated with Leaked Coolant

Thermal management of Tesla Energy Products is achieved via liquid cooling using a 50/50 mixture of ethylene glycol and water. A typical Powerpack system includes about 26 L of coolant (Powerpack 2) or about 22 L of coolant (Powerpack 1). A typical Powerwall system includes about 1.6 L of coolant (Powerwall 1) or about 2.3 L of coolant (Powerwall 2). The Tesla Inverter (fully populated) includes about 11 L of coolant. Mechanical damage of a Tesla Energy Product that has been installed could result in leakage of the coolant. The fluid is blue in color and does not emit a strong odor.

For information regarding the toxicological hazards associated with ethylene glycol, as well as ecological effects and disposal considerations, refer to the specific Safety Data Sheet (SDS) for battery coolant.

Extended exposure of a Tesla Energy Product to leaked coolant could cause additional damage to the product such as corrosion and compromise of protection electronics.

e. Hazards Associated with Leaked Refrigerant (Powerpack Only)

The Powerpack thermal management system includes 400g of R134a: 1,1,1,2-Tetrafluoroethane refrigerant in a sealed system. Mechanical damage of a Powerpack could result in a release of the refrigerant. Such a release would appear similar to the emission of smoke.

For information regarding the toxicological hazards associated with R134a, as well as ecological effects and disposal considerations, refer to the specific Safety Data Sheet (SDS) for R134a.

f. Hazards Associated with Leaked Electrolyte

The electrolyte within constituent cells includes a volatile hydrocarbon-based liquid and a dissolved lithium salt (which is a source of lithium ions) such as lithium hexafluorophosphate. The electrolyte is largely absorbed in electrodes within

individual sealed cells. Under normal usage conditions battery electrolyte should not be encountered by anyone handling a Tesla Energy Product.

Severe mechanical damage (e.g., severe crushing) can cause a small quantity of electrolyte (up to approximately 1 g) to leak out of a cell. For the electrolyte liquid to come into contact with a user of a Tesla Energy Product, the Powerpack system or Powerwall external enclosure, the Pod enclosure, and the cell would have to be mechanically damaged.

The possibility of a spill of electrolyte from a Tesla Powerpack system and Powerwall is very remote. Electrolyte can be extracted from a single cell using a centrifuge, or under some extreme abuse conditions such as a severe crush. However, it is very difficult to mechanically damage cells in such a way as to cause leakage of electrolyte. Even if a single cell were damaged in a manner that could cause electrolyte leakage, it is extremely difficult to cause a leak from more than a few cells due to any incident. Furthermore, cells are connected into modules which are placed within a sealed steel, compartmentalized enclosure. Each compartment has the capacity to contain liquid from a large number of individual cells.

Any released electrolyte liquid is likely to evaporate rapidly, leaving a white salt residue. Evaporated electrolyte is flammable and will contain alkyl-carbonate compounds. Leaked electrolyte is colorless and characterized by a sweet odor. If an odor is obvious, evacuate or clear the surrounding area and ventilate the area. **WARNING: AVOID CONTACT WITH ELECTROLYTE.**

Leaked electrolyte solution is flammable and corrosive / irritating to the eyes and skin. If a liquid is observed that is suspected electrolyte, ventilate the area and avoid contact with the liquid until a positive identification can be made and sufficient protective equipment can be obtained (eye, skin, and respiratory protection). Chemical classifier strips can be used to identify the spilled liquid (electrolyte will contain petroleum/organic solvent and fluoride compounds).

In case of an electrolyte leak, the following protective equipment is recommended: an air purifying respirator with organic vapor/acid gas cartridges, safety goggles or a full face respirator, and safety gloves (Butyl rubber or laminated film (e.g., Silver Shield)). Protective clothing should be worn. Use a dry absorbent material to clean up a spill.

g. Hazards Associated with Vented Electrolyte

Lithium-ion cells are sealed units, and thus under normal usage conditions, venting of electrolyte should not occur. If subjected to abnormal heating or other abuse conditions, electrolyte and electrolyte decomposition products can vaporize and be vented from cells. Accumulation of liquid electrolyte is unlikely in the case of abnormal heating. Vented gases are a common early indicator of a thermal runaway reaction – an abnormal and hazardous condition.

If gases or smoke are observed escaping from a Tesla Energy Product, evacuate the area and notify a first responder team and/or the local fire department. Gases or smoke exiting a lithium-ion battery pack are likely flammable and could ignite unexpectedly as the condition that led to cell venting may also cause ignition of the vent gases. A venting Tesla Energy Product should only be approached with extreme caution by trained first responders equipped with appropriate personal protective equipment (PPE), as discussed in Section 3.

Cell vent gas composition will depend upon a number of factors, including cell composition, cell state of charge, and the cause of cell venting. Vent gases may include volatile organic compounds (VOCs) such as alkyl-carbonates, methane, ethylene, and ethane; hydrogen gas; carbon dioxide; carbon monoxide; soot; and particulates containing oxides of nickel, aluminum, lithium, copper, and cobalt. Additionally, phosphorus pentafluoride, POF_3, and HF vapors may form.

WARNING: AVOID CONTACT WITH VENTED GASES. Vented gases may irritate the eyes, skin, and throat. Cell vent gases are typically hot; upon exit from a cell, vent gas temperatures can exceed 600°C (1,110°F). Contact with hot gases can cause thermal burns. Vented electrolyte is flammable, and may ignite on contact with a competent ignition source such as an open flame, spark, or a sufficiently heated surface. Vented electrolyte may also ignite on contact with cells undergoing a thermal runaway reaction.

3. Firefighting Measures

Responding to a Venting Tesla Energy Product: Smoke emanating from a Tesla Energy Product is an indication of an abnormal and hazardous condition. Smoke will always be the first sign of a thermal runaway event. The smoke is likely flammable and may ignite at any time. If fire or smoke is observed emanating from a Tesla Energy Product at any time, the following should be performed:

1. If possible, shut off the unit/system (see instructions below)
2. Evacuate the area
3. Notify appropriately trained first responders and the local fire department

WARNING: When responding to a smoke or fire event with the Powerpack system, do not approach the Powerpack units from the front (door-side). Perform all incident response from the sides or rear of the unit.

How to Shut Off the Powerpack System or Powerwall in an Emergency:

Powerpack System:

1. If an E-Stop button is present on the inverter door, engage the E-Stop
2. Open the AC disconnect installed upstream of the system
3. Open the DC disconnect switch on the inverter door

Powerwall: Open the AC disconnect installed upstream of the unit.

WARNING: Shutting off power to the Tesla Energy Product does not de-energize the battery, and a shock hazard may still be present.

The Tesla Energy Product should then be monitored for evidence of continued smoke venting. Application of high volumes of water from a safe distance may help cool the unit and prevent further reaction or a fire from developing. If a fire develops and visible flames appear, the Incident Commander should determine whether an attempt will be made to suppress the fire (aggressive firefighting) or allow the battery to burn until it self-extinguishes, while protecting surrounding materials (defensive firefighting). Tesla recommends that copious volumes of water be used to fight a fire involving Tesla Energy Products. Virtually all fires involving lithium-ion batteries can be controlled with water. To date, water has been found to be the most effective agent for controlling lithium-ion battery fires. Water will suppress flames and can cool cells, limiting propagation of thermal runaway reactions. If water is used, electrolysis of water (splitting of water into hydrogen and oxygen) may contribute to the flammable gas mixture formed by venting cells, burning plastic, and burning of other combustibles.

Gaseous agents such as CO_2 or Halon, or dry chemical suppressants may temporarily suppress flaming of lithium-ion battery packs, but they will not cool lithium-ion batteries and will not limit the propagation of cell thermal runaway reactions. Metal fire suppressants such as LITH-X, graphite powder, or copper powder are not appropriate agents for suppressing fires involving lithium-ion battery packs as they are unlikely to be effective.

A battery fire may continue for several hours and it may take 24 hours or longer for the battery pack to cool. A lithium-ion battery fire that has been extinguished can re-ignite due to the exothermic reaction of constituent materials from broken or damaged cells. To avoid this, remove sources of ignition and cool the burned mass by flooding with water.

Aggressive Firefighting: If a decision is made to aggressively fight a fire involving a Tesla Energy Product, then copious amounts of water should be applied from a safe distance. The water may not suppress all cell thermal runaway reactions within the battery pack, but it may cool cells and control the spread of the fire. When responding to a fire event with the Powerpack system, do not approach the Powerpack units from the front (door-side). Perform all incident response from the sides or rear of the unit. If possible, direct the application of water towards openings in the battery pack enclosure, if any have formed, with the intent of flooding the pack enclosure. The objective is to contact the surfaces of the affected and surrounding individual battery pods and cells with water.

Defensive Firefighting If a decision is made to fight a Tesla Energy Product fire defensively, then the fire crew should pull back a safe distance and allow the battery to burn itself out. Fire crews may choose to utilize a water stream or fog pattern to protect exposures or control the path of smoke. When responding to a fire event with the Powerpack system, do not approach the Powerpack units from the front (door-side). Perform all incident response from the sides or rear of the unit. A battery fire may continue for several hours and may result in multiple re-ignition events. It may take 24 hours or longer for the battery pack to cool.

Firefighter PPE. Firefighters should wear self-contained breathing apparatus (SCBA) and fire protective turnout gear. Cells or batteries may flame or leak potentially hazardous organic vapors if exposed to excessive heat, fire or over voltage conditions. These vapors may include volatile organic compounds (VOCs), hydrogen gas, carbon dioxide, carbon monoxide, soot, and particulates containing oxides of nickel, aluminum, lithium, copper, and cobalt. Additionally, phosphorus pentafluoride, POF3 and HF vapors may form.

4. First Aid Measures

Electric Shock / Electrocution: Seek immediate medical assistance if an electrical shock or electrocution has occurred (or is suspected).

Contact with Leaked Electrolyte: The constituent battery cells are sealed. Contents of an open (broken) constituent battery cell can cause skin irritation and/or chemical burns. If materials from a ruptured or otherwise damaged cell or battery contact skin, flush immediately with water and wash affected area with soap and water. If a chemical burn occurs or if irritation persists, seek medical assistance.

For eye contact, flush with significant amounts of water for 15 minutes without rubbing and see physician at once.

Inhalation of Electrolyte Vapors: If inhalation of electrolyte vapors occurs, move person into fresh air. If not breathing give artificial respiration. Seek immediate medical assistance.

Vent Gas Inhalation: The constituent battery cells are sealed and venting of cells should not occur during normal use. If inhalation of vent gases occurs, move person into fresh air. If not breathing give artificial respiration. Seek immediate medical assistance.

5. Storage Precautions

Powerpack systems, Powerwalls, and sub-assemblies should be stored in approved packaging prior to installation.

Do not store Tesla Energy Products in a manner that allows terminals to short circuit (do not allow the formation of an electrically-conductive path).

Elevated temperatures can result in reduced battery service life. Powerpack systems and Powerwalls can withstand temperatures of -40°C to 60°C for up to 24 hours. However, Tesla Energy Products stored for longer than one month should be stored at temperatures between -20°C and 30°C (-4°F and 86°F), at humidity <95%, and protected from condensation. Extended, longer-term storage (more than a month) at temperatures outside the recommended range can result in degradation of product lifetime. Storage in areas where temperatures routinely approach or exceed 80°C (176°F) could result in a hazardous condition. Do not store Tesla Energy Products near heating equipment.

Ideally, a Tesla Energy Product should be stored at 50% state of charge (SOC) or less. Tesla Energy Products should not be stored for extended periods either at a full SOC or completely discharged since both conditions adversely impact battery life. Tesla Energy Products should not be stored untended for longer than twelve months since battery service life likely will be adversely impacted.

The storage area should be protected from flooding.

Long-term storage areas should be compliant with the appropriate local fire code requirements.

Acceptable storage density of battery packs and storage height of battery packs will be defined by the local authority having jurisdiction (AHJ). Requirements and limits will be based upon a number of factors including the structural and fire protection characteristics of the storage area and recommendations for fire protection promulgated by the National Fire Protection Association (NFPA) and similar organizations. At the time of this writing, no Commodity Classification has been defined for lithium-ion cells or battery packs (see 2016 NFPA 13: Standard for the Installation of Sprinkler Systems). Until a Commodity Classification has been defined based on testing by NFPA or a similar organization, Tesla recommends treating lithium-ion cells and batteries in packaging as equivalent to a Group A Plastic Commodity.

6. Installation Precautions

Elevated temperatures can result in reduced battery service life, or a hazardous condition.

The allowed installation temperature range for Tesla Powerpack Systems and Powerwalls is between -30°C and 50°C (-22°F and 122°F). Installation in areas with ambient temperatures over 50°C (122°F) is not recommended as this can result in degradation of product lifetime or a hazardous condition.

Installation in areas where temperatures routinely approach or exceed 80°C (176°F) is not permitted, as this could result in a hazardous condition. Do not install batteries near heating equipment.

The installation area should be protected from the risk of flooding. If the equipment is installed in areas below the floodplain where flooding can occur, active or passive flood prevention shall be installed to prevent more than 5 cm. (~2 in.) of standing water for a maximum of 30 minutes.

Installation areas should be compliant with the appropriate local fire code requirements.

7. Handling, Storage, and Transportation of Damaged Tesla Energy Products

If a Tesla Energy Product has been damaged (battery enclosure has been dented or compromised), it is possible that heating is occurring that may eventually lead to a fire. Damaged or opened cells/batteries can result in rapid heating (due to exothermic reaction of constituent materials), the release of flammable vapors, and propagation of self-heating and thermal runaway reactions to neighboring cells.

Before handling or transporting a damaged Tesla Energy Product, wait at least one hour. Smoke may be an indication that a thermal reaction is in progress. If no smoke, flame, leakage of electrolyte, leakage of coolant, or signs of heat has been observed for one hour, the Tesla Energy Product may be disconnected and moved into a safe location. To obtain specific instructions for evaluating, disconnecting, and preparing a damaged Tesla Energy Product for transport, please contact the Tesla Service team:

- PowerpackSupport@tesla.com
- (650) 681-6060

A damaged Tesla Energy Product should be monitored during storage for evidence of smoke, flame, leakage of electrolyte, leakage of coolant, or signs of heat. If full-time monitoring of the Product is not possible (for example during extended storage), the Product should be moved to a safe storage location.

A safe storage location for a damaged battery will be free of flammable materials, accessible only by trained professionals, and 50 feet downwind of occupied structures. For example, a fenced, open yard may be an appropriate safe location. **DO NOT STORE DAMAGED TESLA ENERGY PRODUCTS ADJACENT TO UNDAMAGED TESLA ENERGY PRODUCTS.** It is possible that a damaged battery may sustain further damage during transportation, and may lead to a fire. To further reduce this risk, handle the damaged battery with extreme caution.

8. Disposal Procedures

Tesla Energy lithium-ion batteries do not contain heavy metals such as lead, cadmium, or mercury.

Tesla Energy Products should be disposed of or recycled in accordance with local, state, and federal regulations. Note that regulations regarding disposal of batteries vary by jurisdiction. In the United States, batteries are classified as Universal Waste, and in addition, many individual states have specific regulations regarding disposal of battery packs. For example, in California, all batteries must be taken to a Universal Waste handler or authorized recycling facility.

Tesla Energy Products contain recyclable materials. Tesla strongly encourages recycling. At this time, when a Tesla product must be decommissioned, we request that it be returned to a Tesla facility for disassembly and further processing.

If disposing without return to Tesla, please consult with local, state and/or federal authorities on the appropriate methods for disposal and recycling. Tesla has confirmed that at least two recycling processors are capable of recycling Tesla battery products in North America and three in the Europe, the Middle East and Africa (EMEA) region.

9. Maintenance or Repair

Tesla requests all maintenance, service, and repairs of Tesla Energy Products be performed by Tesla approved service personnel or Tesla authorized repair facilities. This includes all proactive and corrective maintenance over the lifetime of a Tesla Energy Product. Improper service or repair by personnel not approved nor authorized by Tesla could void the Powerpack 2 System Limited Warranty, lead to failure of the Tesla Energy product, and potentially result in development of an unsafe condition and unexpected electrical events.

10. Transport Information

Lithium-ion batteries are regulated as Class 9 Miscellaneous dangerous goods (also known as “hazardous materials”) pursuant to the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air, International Air Transport Association (IATA) Dangerous Goods Regulations, the International Maritime Dangerous Goods (IMDG) Code, European Agreements concerning the International Carriage of Dangerous Goods by Rail (RID) and Road (ADR), and applicable national regulations such as the USA’s hazardous materials regulations (see 49 CFR 173.185). These regulations contain very specific packaging, labeling, marking, and documentation requirements. The regulations also require that individuals involved in the preparation of dangerous goods for transport be trained on how to properly package, label, mark and prepare shipping documents.

UN Number	3480
Proper Shipping Name	Lithium Ion Batteries
Hazard Classification	Class 9 Miscellaneous
Packing Group	N/A

NOTICE: The information and recommendations set forth are made in good faith and believed to be accurate as of the date of preparation. TESLA, INC. makes no warranty, expressed or implied, with respect to this information.

Revision Log

Revision #	Date	Description
01	14-July-2015	ERG for Tesla Powerpack systems, Powerwalls, and Sub-assemblies
02	3-Sept-2015	Added part numbers, updated weights, voltages, and temperatures, clarified hazards associated with spilled electrolyte, updated storage requirements, updated warning label icons, updated packing group.
03	3-Oct-2016	Added part numbers, minor edits
04	30-June-2017	Added fire ground operations response for Powerpack 2, including approach; exhaust gases; and safety. Updated general product information and contacts, as well as part numbers and reman numbers
05	22-Oct 2018	Reformatted for ease of use and translation; removed Confidential status; corrected phone number for CHEMTREC