



# LSV-100 A 10kW Opportunity Charger

## INSTALLATION AND OPERATION GUIDE



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## SPECIFICATIONS

<b>Application:</b>	Opportunity battery charging
<b>Input Voltage:</b>	208V, 3-ph, 50/60 Hz -or- 240V, 1-ph, 50/60 Hz, 48 Amps
<b>Input Current:</b>	40 Amps (rms), maximum @ 208V, 3-PH 48 Amps (rms), maximum @ 240V, 1-PH
<b>Output Current:</b>	0-100 ADC
<b>Output Power:</b>	10kW maximum
<b>Battery Voltages:</b>	36, 48, 72, 80, 96V (Nominal) (Refer to nameplate for voltage rating of specific charger)
<b>Battery Types:</b>	Lead Acid (valve regulated or flooded)
<b>Charge Stations:</b>	Single Output
<b>Operating Temp:</b>	-0° C to +46° C
<b>Environment:</b>	Indoor/Outdoor, wall or pedestal mount
<b>Dimensions:</b>	(W/H/D) 24/30/12 inches
<b>Weight:</b>	245 lbs

## 1.0 INTRODUCTION

The eTec LSV-100 battery charging system allows for opportunity charging of an electric vehicle propulsion battery system. This system eliminates potential damage from overcharging, maximizes charge efficiency and enables a quick charge.

The charger includes protection to prevent operation in extreme temperatures, and uses temperature compensation in its battery-charging algorithm.

The charger is factory-set for various output voltages, configured for either a three-phase or single-phase AC input, and suitable for indoor or outdoor application.

This guide provides all the necessary instructions for installing and operating the eTec LSV-100 vehicle opportunity charger. Please follow these instructions in the order in which they are presented in this guide.

Special warnings and precautions are included in section 2.0 and throughout this guide. Please observe them in detail to avoid personal injury and damage to the equipment.



### NOTE

Save the shipping container, as it is required to return the charger if service is necessary

Prior to installation, unpack the charger and position it in a suitable, designated area. Before using the equipment, read all the instructions and any **DANGER**, **WARNING**, and **CAUTION** markings posted on the charger should be read and understood before installation, operation, maintenance or servicing of this product.

These instructions do not purport to cover all details or variations in equipment, or to provide for

every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to eTec.

The contents of this Instruction Manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of eTec. The warranty contained in the contract between the parties is the sole warranty of eTec. Any statements contained herein do not create new warranties or modify the existing warranty.

### Technical Support

In the event that you encounter difficulties during the system installation, or during normal operation of the charging station, please contact an eTec technical representative via the information listed below.

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## 2.0 WARNINGS AND PRECAUTIONS

### Qualified Personnel

A "qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. Such personnel must meet the following qualifications:

- 1) Trained and authorized to energize, de-energize, clear, ground and tag electrical circuits and equipment in accordance with established safety procedures.
- 2) Trained in the proper care and use of protective equipment in accordance with established safety procedures.
- 3) Trained in rendering first aid.

### Symbols Used in This Guide



#### NOTE

This symbol indicates information about the product or the respective part of the user guide that must be observed for proper equipment use or functioning.



#### CAUTION!

This symbol indicates that minor personal injury or material damage can result if the prescribed precautions are not followed.



#### DANGER! SHOCK HAZARD

This symbol indicates death; severe personal injury or substantial property damage can result if proper shock hazard precautions are not taken. The charging circuits operate at high amperage levels.

### TO PREVENT SHOCK HAZARDS

#### Before Applying Power to the System:

Check all components for damage, and check to ensure that there are no loose or disconnected wires, cables or mechanical connections.

Do not disassemble the equipment. Call a qualified service person when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.

Use of an attachment not recommended or sold by eTec may result in a risk of fire, electric shock, or injury to persons.



#### CAUTION!

#### Risk of explosive gases.

Working in the vicinity of a lead acid battery is dangerous. Batteries generate explosive gases during normal battery operation. To reduce the risk of battery explosion, follow these instructions, proper battery handling procedures and those published by the battery manufacturer of any equipment you intend to use in the vicinity of the battery. Review the cautionary markings on these products.

#### In the Event of a Malfunction:

Do not disassemble the equipment. Call a qualified service person or an eTec technical representative when service or repair is required. Incorrect reassembly can result in a significant risk of electric shock or fire. Unauthorized servicing of the equipment may result in voiding of the product warranty.

## 3.0 INSTALLATION

Hazardous voltages are present in this electrical equipment during operation. Non-observance of the safety instructions can result in severe personal injury or property damage.

Only qualified personnel should work on or around the equipment after first becoming thoroughly familiar with all warning and safety notices and maintenance procedures contained herein.

The successful and safe operation of this equipment is dependent on proper handling, installation, operation, servicing and maintenance.

### 3.1 Transport

Vibration and sudden jolts must be avoided during transport, such as when setting the equipment down. Please observe the instructions on the packaging for transport, storage and professional handling.

Inspect the charger enclosure for any dents or damage that might have occurred during shipping. If any equipment is damaged, you must also inform the shipping company immediately to file a formal claim for damage.

The customer should save the original shipping container/system in the event the unit requires service.

### 3.2 Environment

Chargers are sophisticated electronic devices and should be treated accordingly. The use of conformal-coated circuit boards and NEMA type 3R enclosures improves tolerance to hostile environments. However, in a condensing environment all ingredients for electrolysis are present – water, electricity and metal. These

environments should be avoided. Evidence of electrolysis within the unit voids all warranties.

### 3.3 Mounting

Safe operation of this equipment requires the equipment to be mounted and commissioned by qualified personnel taking into account the warning information provided in this Instruction Manual.

During installation, general safety regulations for work on electrical power equipment must be observed as well as the professional handling of tools and the use of personal protective equipment.

The local guidelines and regulations must be observed when mounting and installing the equipment.

### 3.4 AC Wiring



#### **DANGER! SHOCK HAZARD**

Hazardous voltages are present in this electrical equipment during operation. The equipment should be disconnected from the supply before any work is performed. Otherwise, it shall be observed that live electrical components (at hazardous voltage levels) are exposed, which presents a shock hazard.

Only professionally trained, qualified personnel must work on or with the equipment.

The user is responsible for the installation of this unit and any other associated devices or units specified by eTec to be used with this unit. All of the recognized regulations applicable to the locality of installation must be observed. Cable, conduit, dimensioning, fusing, grounding, shutdown, isolation and over current protection should be, especially, observed.

### **3.4 AC Wiring (cont.)**

The LSV-100 Opportunity charger may be factory-set as 208V, three-phase. It is best to confirm the voltage and current ratings by referring to the nameplate or by contacting an eTec technical representative.

The installation should meet the local codes and standards and be done by qualified personnel such as licensed electricians. Consult local code and the National Electric Code (NEC) regarding proper disconnecting means, wire size, connectors and conduit.

This charger is not phase sensitive, and the branch circuit feeder conductors shall be connected inside the enclosure to the terminals marked:

Three-Phase Configuration:

L1, L2, L3 and Gnd,

Single-Phase Configuration:

L1, L2 and Gnd

#### **Maximum Actual Current and Voltage Ratings**

Three-Phase Configuration:

Amperes: 40A

Voltage: 208V, 3-Phase, 3-Wire

Single-Phase Configuration:

Amperes: 48A

Voltage: 240V, 1-Phase, 2-Wire

#### **Branch Circuit Ratings**

Three-Phase Configuration: 50Amp

Single-Phase Configuration: 60Amp

#### **Minimum Branch Circuit Feeders \***

Three-Phase Configuration:

(3) #6 Copper, 90 °C Conductors

(1) #10 Copper, Ground Conductor

\*These are minimum circuit sizes required for proper charger operation. Building codes and other applicable regulations may require different specifications.



## **CAUTION!**

Be sure of the polarity when making battery connections. Serious damage, risk of shock, generation of explosive gases, and fire can result from improper connections. Qualified personnel shall execute maintenance and service work, only.

This vehicle opportunity charging unit requires a specific output cable assembly and termination configuration that is provided with the charging unit and must be used with an eTec vehicle conversion kit. No other manufacturer's cable and/or any other wiring configuration should be used with this product. Use of any cable or termination configuration other than provided by eTec shall void all warranties.

In the event that service or repair is performed on the output wiring, refer to the trouble-shooting section of this guide and/or by contacting an eTec technical representative.



## 4.0 MAINTENANCE AND SERVICE

### **This charger operates at high voltage!**

The charger's DC bus has hazardous voltage levels up to 5 minutes after the charger has been de-energized, due to the output capacitors. As such, the equipment must only be opened and serviced after that time. Qualified personnel shall execute maintenance and service work, only.

The power and control terminals can still be at hazardous voltage levels even though the AC input is turned off. To reduce the risk of electric shock, disconnect all of the AC input and DC output wiring before attempting any maintenance. Turning off the charger, alone, will not reduce this risk. **Disconnect batteries before servicing any connected equipment.** Batteries produce power to the output terminals of the charger. If it is necessary for the charger to be powered up while being serviced:

- a) Never touch any live components.
- b) Only use the appropriate measuring and test equipment and protective clothing.
- c) Always stand on an ungrounded, isolated pad.

**NOTE:** If these warnings are not observed, service on the equipment can result in electric shock, fire and/or significant material damage.

To maintain warranty, only replacement parts authorized by eTec may be used. Always have your product Order Number and Serial Number available when contacting the eTec service department. These numbers, and other important data, are located on the eTec nameplate.

### 4.1 General Service

The only field serviceable component for this charger is the 24Vac, 3A fuse designated for the vehicle interlock contactor. This fuse resides in an in-line type fuse holder located near and above the internal cooling fan assembly.

All other maintenance and service shall be performed at the nearest eTec facility. The customer should contact an eTec technical representative to arrange for proper shipping and use the original shipping container.

### 4.2 Troubleshooting

The eTec LSV-100 charger is equipped with a red LED on the front panel of the unit. This LED will illuminate in the event of an error. The LED will repeatedly flash a given number of times between 1 and 7 with a 2-second pause between a series of flashes. The number of flashes per series corresponds to one of the following fault conditions:

- 1 Vehicle Detection Fault
- 2 Current Not Detected
- 3 Unexpected Current
- 4 Over Current
- 5 Under Current

- 6 Thermal Fault
- 7 Invalid Start Current
- 8 Amp-hour limit reached

Fault 8 indicates that the charger has reached the pre-programmed amp-hour (Ahr) limit. This limit will be different for different software versions. The Standard, multi-voltage software is programmed with a 100 Ahr limit which should be sufficient for most NEV and golf cart batteries. The 80V version is programmed with a 300 Ahr limit. Contact ETEC for information specific to your application.

To clear any fault condition, disconnect the vehicle from the charger, and then reconnect the vehicle to the charger.

In the event that you encounter difficulties during the trouble-shooting, or during normal operation of the charging station, please contact an eTec technical representative via the information listed below.

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## **5.0 OPERATION**

### **5.1 Settings**

The charger is fully configured prior to leaving the factory. Each charger is programmed and will automatically recognize distinct valve-regulated-lead-acid battery system voltage configurations: 36, 48, 72, 80 and/or 96 V. If any other battery system voltage is desired, contact an eTec sales representative.

### **5.2 Start-up Sequence**

After the proper connection has been made to the AC line, the AC input breaker may be closed, and provided the eTec vehicle conversion kit has been properly installed, the LSV-100 is ready to charge.

When a vehicle battery system charge is required, park the vehicle with the vehicle charge port near the charging unit and securely connect the DC output cable to the vehicle. Charging will automatically commence.

### **5.3 General Operation**

This charger is equipped with automatic charge initiation. Upon securely connecting the charge connector, the charger will automatically identify the specific battery voltage and charging will commence, provided that no fault condition has been identified.

The charger user interface consists of four LEDs on the front panel of the unit (from top to bottom):

**White:** The charger has been powered up and is ready for use. The vehicle can then be connected to the charger. (This LED normally blinks).

**Blue:** Charging is underway. The speed at which the blue light flashes indicates the rate of charge being supplied to the batteries.

**Green:** Charging has completed and it is safe to disconnect the vehicle from the charger.

**Red:** A fault condition has been identified. Please refer to the troubleshooting section for assistance.

## **5.4 Charge Completion**

The charger can be left unattended and will stop delivering current when the battery is full. The green charge complete LED will illuminate. The DC output cable can be disconnected from the vehicle.

## **5.5 Charge Interruption**

If it is necessary to terminate a charge while the charger is operating, slowly remove the charge connector from the vehicle. The charger will stop delivering current once the pilot circuit pins disconnect. The pilot circuit pins are the first to disconnect compared to the other pins. As the DC output cable is disconnected (and the pilot pins disconnect), the main drive control system of the charger stops delivering power. This allows the DC output cable to be safely disconnected from the vehicle.