

RE

# ENERGY STORAGE SOLUTIONS

for Renewable Energy / Hybrid Systems / Backup Power



**Trojan**<sup>®</sup>  
BATTERY COMPANY

*Clean energy for life.*

**Made in USA**





## IMAGINE A WORLD OF CLEAN ENERGY FOR EVERYONE.

**IN KENYA, A FAMILY GATHERS FOR DINNER IN A SMALL HOUSE POWERED BY AN OFF-GRID SOLAR HOME SYSTEM...**

**IN INDIA, AN ECO-RESORT GENERATES RELIABLE ELECTRICITY FROM A MICRO-GRID...**

**IN NICARAGUA, A RURAL TELECOM TOWER SUPPLIES COMMUNICATIONS TO REMOTE AREAS USING RENEWABLE ENERGY...**

Renewable Energy (RE) installations are rapidly growing all around the world. Today, in the developing regions of the world where electricity is scarce, more than 1.6 billion people live without access to reliable electric power; unable to meet their basic human needs due to lack of reliable lighting, communications, health care and clean water.

In these areas, renewable energy provides a resource that allows children to learn, families to prosper and businesses to grow. Industrial, commercial and residential applications that rely on clean energy are rapidly growing worldwide.

As the leading manufacturer of deep-cycle batteries, Trojan Battery Company believes it is possible to make a global shift to energy sources that are environmentally friendly and readily available worldwide. For more than 85 years, Trojan Battery has focused its experience and expertise in deep-cycle technology on manufacturing the highest quality, deep-cycle batteries available in the industry.

If there is one thing we've learned over the years, it's that a truly outstanding battery must provide rugged durability, long life and reliable performance day in and day out. To address the issue of Partial State of Charge (PSOC), common in RE, telecom and inverter backup applications, Trojan's engineering team has developed Smart Carbon™, a proprietary formula of carbon additives designed to enhance life and performance of Trojan Industrial and Premium Line of batteries operating in PSOC. Trojan Battery is the first manufacturer to introduce a carbon additive in deep-cycle flooded renewable energy batteries.

We understand the importance of these performance features and that is why we offer the broadest portfolio of high-quality, deep-cycle flooded, AGM and gel products available for a wide range of renewable energy hybrid systems and backup power applications. With our broad portfolio of renewable energy products, you'll find a Trojan battery perfectly suited to your application.

*At Trojan we are committed to... Clean Energy for Life.*

# *Energy Storage Solutions* Residential and Rural Electrification



## **Off-Grid Residential**

Remote home sites with no access to electricity, often depend on off-grid renewable energy systems to fulfill power requirements. Trojan's deep-cycle batteries enable these homeowners to optimize their renewable energy systems and provide a reliable, cost-effective power source to satisfy their home energy needs.



## **Inverter Backup Power**

The increase in energy consumption around the world places a tremendous demand on existing power grids; with frequent power outages becoming commonplace. As a result, the demand for inverter battery backup systems is growing. Paired with an inverter charger, Trojan battery backup systems provide stable and reliable power when the local grid is unavailable.



## **Solar Home Systems (SHS)**

Use of solar and wind power home systems are rapidly growing as renewable energy technologies become more affordable and available worldwide. Families which have no access or limited access to electricity can now use lights, appliances, or other electrical devices in the evening or when weather conditions limit the energy production of solar or wind systems. Trojan batteries are the ideal energy storage solution for these types of off-grid renewable energy applications, providing reliable and cost-effective power and performance.



## **Rural Community Buildings**

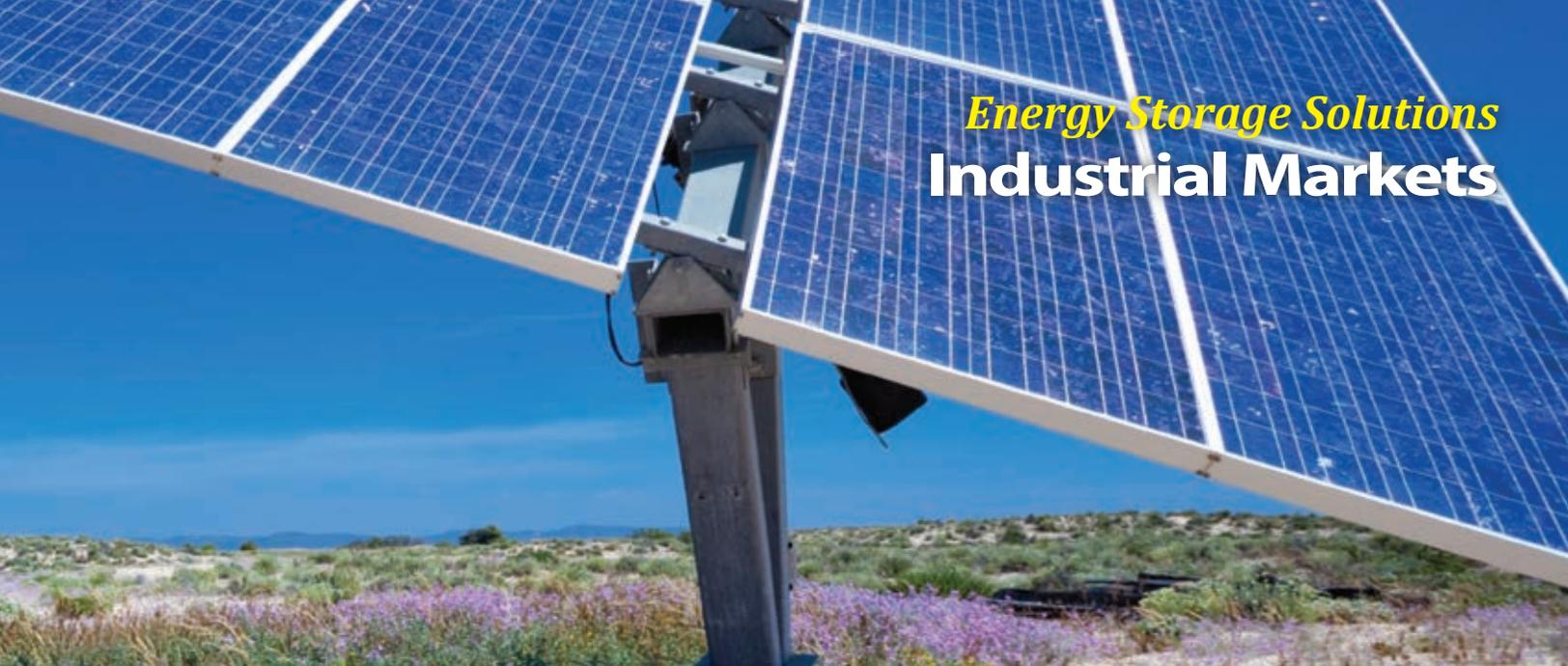
With 80 percent of the world's population living in remote areas around the world, local schools, hospitals, and other community buildings in these regions often have no access to electricity. Off-grid battery-based renewable energy systems are being implemented to provide residents stable and reliable power. The use of Trojan deep-cycle battery energy storage solutions enable these communities to access electrical power for lighting, computers, refrigerators and other important equipment.



## **Micro-Grids**

Micro-grid systems powered by solar, wind and hybrid renewable energy sources generate consistent electricity in remote areas where grid expansion is not an option. The key to a successful micro-grid is a reliable energy storage solution using batteries designed for deep-cycle applications, such as Trojan's line of deep-cycle flooded, AGM and gel batteries. A Trojan battery-based energy storage system provides dependable electricity to village residents.

# Energy Storage Solutions Industrial Markets



## Lighting

Off-grid street and area lighting applications require batteries that can withstand the daily deep battery cycling inherent in solar applications. Many highway, traffic, parking, neighborhood and security lighting projects depend on Trojan's deep-cycle AGM battery technology for long battery life and consistent performance day in and day out.



## Telecom Networks

Reliable wireless communication is something demanded from all service providers. With most telecom equipment located in remote areas with no access to the grid, telecom companies are presented with the challenge on how to effectively supply electricity to these locations. Solar, wind and hybrid systems with battery backup for energy storage using Trojan's deep-cycle batteries have proven to be the most cost-effective and reliable solution to power these remote communication devices.



## Security

Security systems in remote locations must have a consistent power source in order to provide effective coverage. When access to grid power is not available, a battery-based solar energy solution is a low maintenance and cost-effective way for remote security systems to operate without interruption. Trojan's deep-cycle batteries deliver reliable power for these applications operating in the most remote, rugged or harsh conditions.



## Oil and Gas

Remote oil and natural gas production sites are quickly adopting renewable energy systems with battery backup storage to provide consistent, reliable power for equipment. Trojan's deep-cycle batteries deliver electricity to these isolated well sites to operate automation, monitoring, control, alarming and point-to-point radio communication applications.



## Communications

Small-load telemetry applications frequently require the repositioning of a radio transmitter/receiver in remote, sometimes rugged locations. To enhance response times for critical repositioning activities, stand-alone battery-based solar power systems are implemented to provide a reliable energy storage solution to power this equipment. Trojan's deep-cycle batteries are designed for peak performance in these types of applications.



# Deep-Cycle Flooded Batteries

## Smart Carbon™



## Smart Carbon™

### Trojan's Intelligent Solution for Partial State of Charge (PSOC)

Deep-cycle batteries used in off-grid and unstable grid applications are heavily cycled at partial state of charge (PSOC). Operating at PSOC on a regular basis can quickly diminish the overall life of a battery, which results in frequent and costly battery replacements.

To address the impact of PSOC on deep-cycle batteries in renewable energy (RE), inverter backup and telecom applications, Trojan Battery has now included Smart Carbon™ as a standard feature in its Industrial and Premium flooded battery lines.

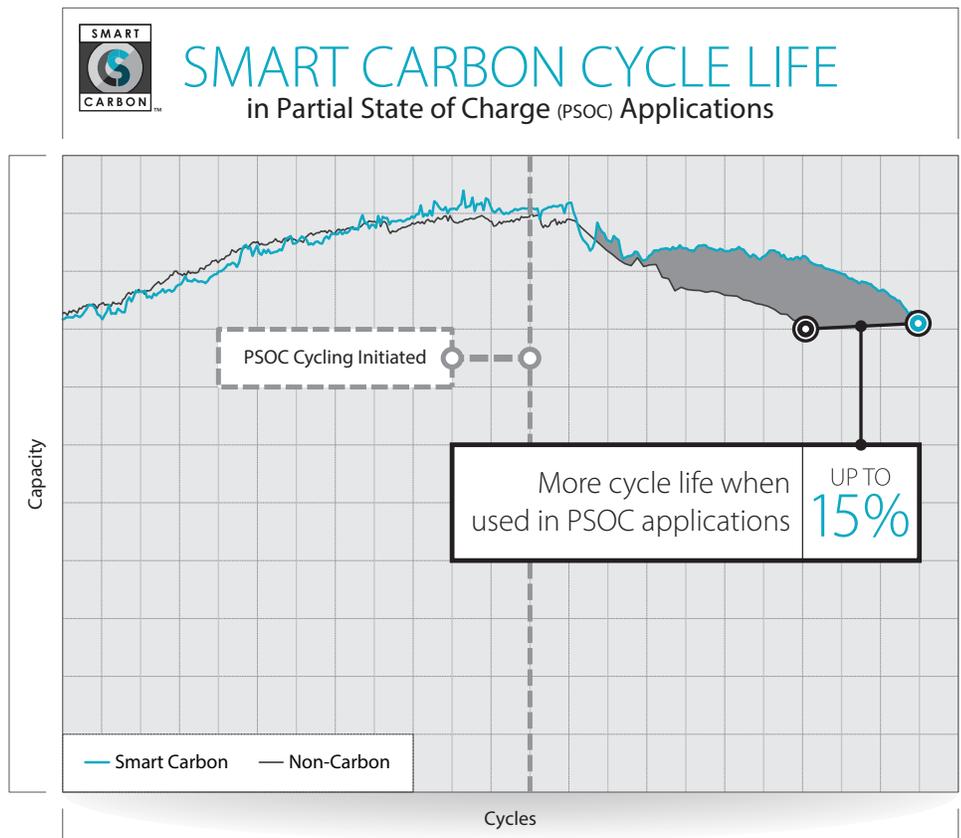
Based on more than five years of research and development by Trojan's engineering team, Smart Carbon is Trojan's proprietary formula which provides improved performance when the batteries operate in PSOC, enhancing overall battery life in applications where the batteries are under charged on a regular basis.

Trojan Battery is the first manufacturer to introduce a carbon additive as a standard feature in deep-cycle flooded batteries used in RE, inverter backup and telecom applications.

The inclusion of Smart Carbon to Trojan's Industrial and Premium lines provides:

- A decrease in the rate of sulfation in PSOC conditions
- Improved charge acceptance
- Faster recharge in PSOC applications
- High energy efficiency

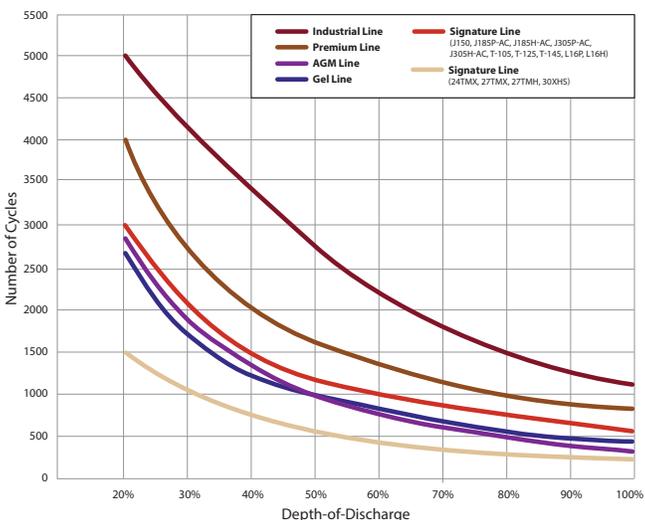
The addition of Smart Carbon builds on Trojan's commitment to provide deep-cycle batteries that offer long cycle life, durable design and consistent power day in and day out.



# Battery Testing and Sizing

## Cycle Life Chart

The single most important factor to consider when purchasing a deep-cycle battery for a renewable energy application is cycle life. The cycle life rating is the number of discharge/charge cycles the battery can provide over its lifetime. This will allow you to determine the true value of the battery over its life by understanding the total cost of ownership. This chart illustrates the cycle life ratings for the Trojan lines of deep-cycle batteries for renewable energy applications.



## The Importance of Testing PV Batteries to the IEC 61427 Standard

Batteries in Photovoltaic Systems (PV) are unique in how they are used because recharging them is primarily dependent on the changes in the weather, and proper charging is crucial to getting the most life from a deep-cycle battery. In addition, experience has shown that batteries in PV systems are routinely undersized either due to cost considerations or because the loads were underestimated for the system.

As a result, life expectancy of PV batteries is difficult to quantify – until now. The International Electrotechnical Commission's (IEC) standard 61427 titled *Secondary cells and batteries for photovoltaic energy systems (PVES) – General requirements and methods of test* provides performance criteria that all batteries for PV applications can and should be measured against. It offers a common, internationally-accepted platform to compare and contrast batteries from different manufacturers.

**IEC 61427 STANDARD**  
Secondary cells and batteries for renewable energy storage

17 Years Trojan Battery Industrial Line

8 Years Trojan Battery Premium Line

## Configure your Renewable Energy System with Trojan batteries using the Online RE Off-Grid Battery Sizing Calculator

Trojan's battery sizing calculator is an easier way to determine battery capacity than manually calculating load requirements and then converting them to battery capacity. Customers simply fill in the appropriate information on the electronic form such as battery voltage, desired depth-of-discharge (DOD), days of autonomy, AC and DC loads, device types with power ratings, and hours per day or days per week used, and the application automatically determines the required battery capacity. It then recommends the Trojan battery models for their particular application. The calculator also allows customers to run "what if" scenarios to find specific battery options to meet their budget or configuration requirements.

This valuable sizing tool is available online at [www.batterysizingcalculator.com](http://www.batterysizingcalculator.com).

# Industrial batteries...

designed for 2800 cycles at 50% DOD



The Industrial Line is engineered specifically to support renewable energy systems with large daily loads where the batteries are cycled regularly. These high amp-hour capacity batteries are ideal for use in large off-grid photovoltaic (PV) systems, off-grid hybrid PV systems, grid-tied PV systems with battery backup, smart grid peak shifting systems and a variety of other applications. The Industrial Line is tested to IEC standards and features advanced battery technologies that deliver reliable power. Trojan's Industrial Line is the perfect combination of performance and function.

## Intelligent Design

### Dual Container Protection

Trojan's Industrial Line of deep-cycle batteries is comprised of one, two or three single 2-volt cells, standalone or bundled together, secured in a secondary containment case to form single, high-capacity 2-volt, 4-volt or 6-volt battery solutions. Components of the individual cells are assembled in a rugged polypropylene housing designed to protect the internal plates from potential damage that may be caused during transport and installation. The 2-volt cells are enclosed in a larger polyethylene outer case that protects against damage caused by harsh environmental conditions such as moisture and dirt buildup, as well as safeguards against potential acid leaks. For added protection the thick-walled case features a lattice-design that reinforces the outer case's structural integrity.

### Stability Control

Trojan designed its Industrial Line of batteries with stability in mind. Featuring a lower battery profile and wider stance design, weight is evenly distributed throughout the battery. By creating a wider center of gravity the battery profile enhances overall stability. Molded into the case design are dual handles that enable easy movement during transport and installation.

BCI GROUP SIZE	TYPE	VOLTAGE	CAPACITY <sup>A</sup> Amp-Hours (AH)				ENERGY (kWH) 100-Hr Rate	Default TERMINAL	DIMENSIONS <sup>B</sup> Decimals (mm)			WEIGHT lbs. (kg)
			5-Hr Rate	10-Hr Rate	20-Hr Rate	100-Hr Rate			Length	Width	Height <sup>C</sup>	
<b>INDUSTRIAL LINE - DEEP-CYCLE FLOODED BATTERIES - 2,800 CYCLES @ 50% DOD - WITH SMART CARBON™</b>												
N/A	IND9-6V	6 VOLT	365	414	464	601	3.61	14	15.32 (389)	10.24 (260)	23.54 (598)	220 (100)
N/A	IND13-6V	6 VOLT	545	616	695	902	5.41	14	22.36 (568)	10.34 (263)	23.92 (608)	315 (143)
N/A	IND17-6V	6 VOLT	727	820	925	1202	7.21	14	27.21 (691)	10.38 (264)	23.73 (603)	415 (188)
N/A	IND23-4V	4 VOLT	1000	1129	1270	1654	6.62	14	22.38 (568)	10.34 (263)	23.56 (598)	370 (168)
N/A	IND29-4V	4 VOLT	1274	1448	1618	2105	8.42	14	27.10 (688)	10.35 (263)	23.81 (605)	465 (211)
N/A	IND27-2V	2 VOLT	1215	1368	1520	1954	3.91	14	15.28 (388)	10.38 (264)	24.00 (610)	228(104)
N/A	IND33-2V	2 VOLT	1455	1682	1849	2405	4.81	14	17.33 (440)	10.22 (260)	24.01 (610)	278 (125)

A. The amount of amp-hours (AH) a battery can deliver when discharged at a constant rate at 80°F (27°C) and maintain a voltage above 1.75 V/cell. Capacities are based on peak performance.  
 B. Dimensions are based on nominal size. Dimensions may vary depending on type of handle or terminal. Batteries to be mounted with .5 inches (12.7 mm) spacing minimum.  
 C. Dimensions taken from bottom of the battery to the highest point on the battery. Heights may vary depending on type of terminal.



## Advanced Battery Technology

### 1 Smart Carbon™

For enhanced life and improved performance in RE applications operating in PSOC, Trojan's Industrial and Premium Line of batteries now feature Smart Carbon. Trojan's propriety carbon formula, Smart Carbon, increases the electrochemically active surface area which provides improved charge acceptance and faster recharge in applications where the batteries are under charged on a regular basis.

### 2 Alpha Plus® Paste with T2 Technology™

Trojan's Alpha Plus Paste is a proprietary, high-density paste formulation precisely engineered to deliver outstanding battery performance. This high-density paste optimizes porosity development in the active material utilizing the active material more effectively resulting in sustained battery performance over a longer period of time. Trojan's T2 Technology features a patented T2 metal agent which is incorporated into Trojan's Alpha Plus Paste further strengthening the electrochemical processing capabilities of the paste. Alpha Plus Paste with T2 Technology increases both sustained capacity and total overall ampere-hours resulting in more operating power. It's a key reason why Trojan batteries consistently outperform the competition.

### 3 DuraGrid™ Technology

Trojan's DuraGrid Technology is an innovative grid design specifically engineered for the longer life requirements of demanding renewable energy applications. DuraGrid features a thick grid structure which maintains greater corrosion resistance, effectively increasing the life of the battery for up to 10 years. Exclusive to Trojan's Industrial Line is a low-profile grid configuration that is optimized to enhance current flow throughout the grid network. This low-profile design maximizes the amount of electrolyte resulting in longer intervals between watering.

### 4 Reinforced Protection Wrap

Trojan's Industrial batteries are engineered with a robust positive plate construction that enhances overall performance. Trojan's DuraGrid technology combined with Alpha Plus paste securely locks the active materials to the grid; creating an exceptionally strong positive plate. The Industrial Line includes a five component wrapping and insulating system comprised of a stranded vertical slyver with a 20 mil backing mat and a secondary 20 mil horizontal compression mat. The entire mat is wrapped with edge-protecting Koroseal that is heat bonded as well as bonded to the plastic boot to protect the bottom of the plate and to keep the Koroseal in place. The advanced plate construction protects against shedding and assures the electrochemical performance of the battery's active materials.

### 5 Maxguard® XL Separator

Exclusively available in Trojan's Industrial and Premium batteries is the Maxguard XL separator. Featuring a wide-channel design, the Maxguard XL separator increases acid flow for optimum battery performance. Thirty percent thicker than Trojan's standard flooded battery separators, the Maxguard XL provides even greater resistance to stratification which is a typical mode of failure in batteries used in renewable energy systems.

### 6 Moss Shield

Trojan's Industrial Line of deep-cycle batteries includes a full length moss shield to protect the separators from damage. The moss shield increases the battery life by protecting the top of the plates from shorting to the cell strap.





# Premium batteries... designed for 1600 cycles at 50% DOD

Renewable energy applications operate under challenging conditions such as fluctuating or extreme temperatures, remote locations and the intermittent nature of solar and wind power generation.

Designed with a 10-year battery life, Trojan Battery's Premium Line of flooded deep-cycle batteries is specifically engineered to withstand the rigorous conditions of renewable energy applications. Our product strategy is focused on one simple objective – manufacture the highest quality battery available in the industry which is why our Premium Line is tested to IEC standards.

## 1 Smart Carbon™

For enhanced life and improved performance in RE applications operating in PSOC, Trojan's Industrial and Premium Line of batteries now feature Smart Carbon. Trojan's propriety carbon formula, Smart Carbon, increases the electrochemically active surface area which provides improved charge acceptance and faster recharge in applications where the batteries are under charged on a regular basis.

## 2 Alpha Plus® Paste with T2 Technology™

Trojan's Alpha Plus Paste is a proprietary, high-density paste formulation precisely engineered to deliver outstanding battery performance. This high-density paste optimizes porosity development in the active material utilizing the active material more effectively resulting in sustained battery performance over a longer period of time. Trojan's T2 Technology features a patented T2 metal agent which is incorporated into Trojan's Alpha Plus Paste further strengthening the electrochemical processing capabilities of Alpha Plus Paste. Alpha Plus Paste with T2 Technology increases both sustained capacity and total overall ampere-hours resulting in more operating power for your application. It's a key reason why Trojan batteries consistently outperform the competition.

## 3 DuraGrid™ Technology

Trojan's DuraGrid Technology is a grid design specifically engineered for the longer life requirements of renewable energy applications. DuraGrid features a thicker grid structure maintaining even greater corrosion resistance effectively increasing the life of the battery for up to 10 years. Trojan's DuraGrid Technology combined with the Maxguard XL separator offers excellent charge efficiency allowing the batteries to charge quickly throughout the life of the battery.

## 4 Maxguard® XL Separator

In renewable energy applications batteries may go days without a charge and they frequently operate at partial states of charge. Recognizing the rigorous use of batteries in renewable energy systems, Trojan incorporated the Maxguard XL advanced separator into its battery design. Exclusively available in Trojan's Premium and Industrial Lines of batteries, the Maxguard XL separator is 30 percent thicker than our T2 flooded battery separator. The Maxguard XL provides even greater resistance to stratification which is typically a mode of failure in batteries used in renewable energy systems.

BCI GROUP SIZE	TYPE	VOLTAGE	CAPACITY <sup>A</sup> Amp-Hours (AH)				ENERGY (kWH) 100-Hr Rate	Default TERMINAL	DIMENSIONS <sup>B</sup> Decimals (mm)			WEIGHT lbs. (Kg)
			5-Hr Rate	10-Hr Rate	20-Hr Rate	100-Hr Rate			Length	Width	Height <sup>C</sup>	
<b>PREMIUM LINE - DEEP-CYCLE FLOODED BATTERIES - 1,600 CYCLES @ 50% DOD - WITH SMART CARBON™</b>												
GC2H	T-10S RE	6 VOLT	185	207	225	250	1.50	5	10.30 (262)	7.11 (181)	11.67 (296)	67 (30)
903	L16RE-A*	6 VOLT	267	299	325	360	2.16	5	11.67 (296)	6.95 (177)	17.56 (446)	115 (52)
903	L16RE-B*	6 VOLT	303	340	370	410	2.46	5	11.67 (296)	6.95 (177)	17.56 (446)	118 (54)
903	L16RE-2V*	2 VOLT	909	1021	1110	1235	2.47	5	11.67 (296)	6.95 (177)	17.56 (446)	119 (54)

\* Polyon™ Case

A. The amount of amp-hours (AH) a battery can deliver when discharged at a constant rate at 80°F (27°C) for the 20-Hour and 100-Hour rates and 86°F (30°C) for the 5-Hour rate and maintain a voltage above 1.75 V/cell. Capacities are based on peak performance.

B. Dimensions are based on nominal size. Dimensions may vary depending on type of handle or terminal. Batteries to be mounted with .5 inches (12.7 mm) spacing minimum.

C. Dimensions taken from bottom of the battery to the highest point on the battery. Heights may vary depending on type of terminal.

## Classic Trojan featuring... T2 Technology™

The Signature Line of deep-cycle flooded batteries is the flagship of Trojan's product portfolio.

Engineered to provide rugged durability and outstanding performance, Trojan's Signature Line is perfectly suited for use in renewable energy systems where lowest life-cycle cost is the key consideration. An all around power house, the Signature Line features Trojan's historically-proven engineering with T2 Technology, an advanced battery technology for maximum sustained performance, longer life and increased total energy.



### 1 Alpha Plus® Paste with T2 Technology™

Trojan's Alpha Plus Paste is a proprietary, high-density paste formulation engineered to deliver outstanding battery performance. It optimizes porosity development in the active material utilizing the active material more effectively resulting in sustained battery performance over a longer period of time. Trojan's T2 Technology introduces a patented T2 metal agent into Alpha Plus Paste strengthening its electrochemical processing capabilities. Alpha Plus Paste with T2 Technology increase both sustained capacity and total overall ampere-hours resulting in more operating power. It's a key reason why Trojan batteries consistently outperform the competition.

### 2 Trojan Grid Technology

Trojan's grid technology is a lead antimony alloy grid mixture formulated specifically for use with Trojan's Alpha Plus Paste with T2 Technology. The grid formulation provides exceptional structural adhesion between the Alpha Plus Paste and the grid frame. Thick grids reinforce the strength of the frame and reduce overall corrosion. The grid configuration is optimized to enhance current flow through the grid network providing exceptional battery performance, reducing downtime and lowering overall maintenance costs.

### 3 Maxguard® T2 Separator

Exclusively available in Trojan batteries is our Maxguard T2 advanced separator. Its multi-rib geometry design keeps acid channels open longer enhancing electrochemical processing while reducing the risk of stratification. Maxguard's proprietary rubber-based material formulation inhibits antimony transfer between the positive grids and negative plates; a protection not available in many other competitor batteries. A newly fortified, thick back web provides even greater separator strength resulting in a more robust battery with increased protection against failures caused by separator degradation. Trojan's Maxguard T2 advanced separator sustains performance, provides longer battery life and significantly lowers operating costs.

BCI GROUP SIZE	TYPE	VOLTAGE	CAPACITY <sup>A</sup> Amp-Hours (AH)				ENERGY (kWH) 100-Hr Rate	Default TERMINAL	DIMENSIONS <sup>B</sup> Decimals (mm)			WEIGHT lbs. (.)
			5-Hr Rate	10-Hr Rate	20-Hr Rate	100-Hr Rate			Length	Width	Height <sup>C</sup>	
<b>SIGNATURE LINE - DEEP-CYCLE FLOODED BATTERIES - 1,200 CYCLES @ 50% DOD</b>												
N/A	J150	12 VOLT	120	134	150	166	1.99	2	13.70 (348)	7.13 (181)	11.13 (283)	84 (38)
921	J185P-AC*	12 VOLT	168	189	205	226	2.71	6	14.97 (380)	6.91 (176)	14.71 (374)	114 (52)
921	J185H-AC*	12 VOLT	185	207	225	249	2.99	6	14.97 (380)	6.91 (176)	14.71 (374)	128 (58)
GC2	T-605	6 VOLT	175	193	210	232	1.39	1	10.30 (262)	7.11 (181)	11.07 (281)	58 (26)
GC2	T-105	6 VOLT	185	207	225	250	1.50	1	10.30 (262)	7.11 (181)	11.07 (281)	62 (28)
GC2	T-125	6 VOLT	195	221	240	266	1.60	1	10.30 (262)	7.11 (181)	11.07 (281)	66 (30)
GC2H	T-145	6 VOLT	215	239	260	287	1.72	1	10.30 (262)	7.11 (181)	11.90 (302)	72 (33)
902	J305P-AC*	6 VOLT	271	304	330	367	2.20	6	11.66 (296)	6.94 (176)	14.42 (366)	96 (44)
902	J305H-AC*	6 VOLT	295	331	360	400	2.40	6	11.66 (296)	6.94 (176)	14.42 (366)	98 (45)
903	L16P*	6 VOLT	344	386	420	467	2.80	5	11.66 (296)	6.94 (176)	16.74 (425)	114 (52)
903	L16H*	6 VOLT	357	400	435	483	2.89	5	11.66 (296)	6.94 (176)	16.74 (425)	125 (57)
<b>SIGNATURE LINE - DEEP-CYCLE FLOODED BATTERIES - 600 CYCLES @ 50% DOD</b>												
24	24TMX	12 VOLT	70	78	85	94	1.13	9	10.92 (277)	6.62 (168)	9.25 (235)	47 (21)
27	27TMX	12 VOLT	85	97	105	117	1.40	9	12.72 (323)	6.60 (168)	9.24 (235)	55 (25)
27	27TMH	12 VOLT	95	106	115	128	1.54	9	12.72 (323)	6.60 (168)	9.24 (235)	61 (28)
30H	30XHS	12 VOLT	105	120	130	144	1.73	9	14.00 (355)	6.73 (171)	10.07 (256)	66 (30)

\* Polyon™ Case

A. The amount of amp-hours (AH) a battery can deliver when discharged at a constant rate at 80°F (27°C) for the 20-Hour and 100-Hour rates and 86°F (30°C) for the 5-Hour rate and maintain a voltage above 1.75 V/cell. Capacities are based on peak performance.

B. Dimensions are based on nominal size. Dimensions may vary depending on type of handle or terminal. Batteries to be mounted with .5 inches (12.7 mm) spacing minimum.

C. Dimensions taken from bottom of the battery to the highest point on the battery. Heights may vary depending on type of terminal.

# AGM & Gel Line



## AGM Line

Trojan's deep-cycle absorbed glass mat (AGM) maintenance-free batteries for renewable energy applications feature a number of design elements to provide optimum performance. Robust plates extend the life-cycle of Trojan's deep-cycle AGM batteries. A separator of glass fibers serves to isolate the positive and negative plates while acting as a blotter to absorb the electrolyte. The separator is maintained under compression between plates to assure contact with plate surfaces. A computer-generated grid design is optimized for high-power density. Low calcium grid alloy reduces gas emissions and a flame arresting, one-way pressure relief vent prevents buildup of excessive pressure. Trojan's deep-cycle AGM batteries are low temperature tolerant, shock and vibration resistant and have a low internal resistance for higher discharge current and higher charging efficiency.

## Gel Line

Trojan's deep-cycle gel batteries are sealed, maintenance-free batteries that deliver superior power in demanding renewable energy applications. Engineered for rugged durability, outstanding performance and long battery life, Trojan's deep-cycle gel batteries feature a number of important design characteristics that provide significant advantages over competing gel products. The gelled electrolyte is a proprietary formulation containing sulfuric acid, fumed silica, pure demineralized, deionized water and a phosphoric acid additive. This exclusive formulation produces a homogenous gel that delivers consistent performance and dramatically long cycle life. The heavy-duty grids lock active material onto the grid network to efficiently deliver more concentrated energy to the terminals. Premium grade, double-insulated separators allow maximum charge flow between the plates for optimum performance.

BCI GROUP SIZE	TYPE	VOLTAGE	CAPACITY <sup>A</sup> Amp-Hours (AH)				ENERGY (kWh)		Default TERMINAL	DIMENSIONS <sup>B</sup> Decimals (mm)			WEIGHT lbs. (Kg)
			5-Hr Rate	10-Hr Rate	20-Hr Rate	100-Hr Rate	100-Hr Rate			Length	Width	Height <sup>C</sup>	
<b>AGM LINE - DEEP-CYCLE VRLA BATTERIES - 1,000 CYCLES @ 50% DOD</b>													
U1	U1-AGM	12 VOLT	29	31	33	34	0.408	13	7.78 (198)	5.20 (138)	6.75 (171)	27 (12)	
22	22-AGM	12 VOLT	43	47	50	52	0.624	13	8.96 (228)	5.49 (139)	8.04 (204)	40 (18)	
24	24-AGM	12 VOLT	67	70	76	84	1.01	6	10.77 (274)	6.84 (174)	8.62 (219)	54 (24)	
27	27-AGM	12 VOLT	77	82	89	99	1.19	6	12.05 (306)	6.84 (174)	9.32 (237)	64 (29)	
31	31-AGM	12 VOLT	82	92	100	111	1.33	6	13.73 (349)	6.80 (173)	9.16 (233)	69 (31)	
GC12	12-AGM	12 VOLT	112	127	140	144	1.72	13	13.54 (344)	6.76 (172)	10.88 (276)	100 (45)	
<b>GEL LINE - DEEP-CYCLE VRLA BATTERIES - 1,000 CYCLES @ 50% DOD</b>													
24	24-GEL	12 VOLT	66	72	77	85	1.02	6	10.92 (277)	6.61 (168)	9.26 (235)	52 (24)	
27	27-GEL	12 VOLT	76	84	91	100	1.20	7	12.73 (323)	6.38 (162)	9.26 (235)	63 (29)	
31	31-GEL	12 VOLT	85	94	102	108	1.30	7	12.94 (329)	6.82 (173)	9.64 (245)	70 (32)	
DIN	5SHP-GEL	12 VOLT	110	115	125	137	1.64	8	13.53 (344)	6.72 (171)	10.99 (279)	85 (39)	
8D	8D-GEL	12 VOLT	188	207	225	265	3.18	5	20.69 (526)	10.95 (278)	10.82 (275)	163 (73)	
GC2	6V-GEL	6 VOLT	154	167	189	198	1.19	6	10.25 (260)	7.08 (180)	10.82 (275)	68 (31)	
DIN	TE35-GEL	6 VOLT	180	193	210	220	1.32	8	9.62 (244)	7.49 (190)	10.70 (272)	69 (31)	

A. The amount of amp-hours (AH) a battery can deliver when discharged at a constant rate at 80°F (27°C) for the 20-Hour and 100-Hour rates and 86°F (30°C) for the 5-Hour rate and maintain a voltage above 1.75 V/cell. Capacities are based on peak performance.

B. Dimensions are based on nominal size. Dimensions may vary depending on type of handle or terminal. Batteries to be mounted with .5 inches (12.7 mm) spacing minimum.

C. Dimensions taken from bottom of the battery to the highest point on the battery. Heights may vary depending on type of terminal.

# Battery Accessories



## Battery Watering Made Easy

The Single-Point Watering Kit simplifies battery watering, maximizing performance and life of Trojan's deep-cycle flooded batteries. The Single-Point Battery Watering Kit comes in three configurations: 12V, 24V and 48V. The kits are designed for single string installations with Trojan Premium, Industrial and Signature Line flooded batteries\*\*. For systems with multiple strings in parallel, simply order multiple kits at the required system voltage.



### Flexible Design

The Single-Point Watering Kit is designed to work with flooded deep-cycle batteries and takes the guess work out of properly watering flooded batteries. The flexible tube routing allows the watering system to work with various battery bank sizes and configurations.

### Automatics Shut-Off Valves

The Single-Point Watering Kit includes automatic shut-off valves, interconnected with tubing, that replace the existing vent caps. A quick coupling allows the system to be connected to a water supply. Once the watering system is installed, water flows into each battery cell until it reaches the correct level. A flow indicator built into the water supply tells the operator when filling has been completed. The entire process generally takes just 30 seconds per battery.



### Extend Battery Life and Performance

A properly watered battery lasts longer and performs better. Overfilling a battery can result in loss of acid, while charging with low electrolyte levels can result in permanent damage to the lead plates. Both can result in loss of capacity and life expectancy.

### Safety

The Single-Point Watering Kit allows to fill your deep-cycle batteries without having to remove the vent covers. The use of a watering kit, avoid battery acid burns, ruined clothing and noxious fumes.

### Trojan Industrial Owner's Package

The Trojan Industrial Owner's Package is designed to assist customers with proper battery installation and maintenance. The package includes a hydrometer, a battery maintenance log and an Industrial battery User's Guide. The owner's package can be purchased through any Trojan Battery distributor or system integrator, and is suitable for Trojan's Industrial Line of deep-cycle batteries.

\*\* The Single-Point Watering Kit is compatible with all Trojan Industrial, Premium, and Signature Line flooded batteries except models 24TMX, 27TMX, 27TMH and 30XH5.



### ***Research and Development***

Quality and innovation are the cornerstones of Trojan's product development. As the leading manufacturer of deep-cycle flooded batteries, Trojan retains two state-of-the-art research and development centers dedicated exclusively to battery technology and innovation. Engineering teams, backed by more than 200 years of deep-cycle development expertise, work together to innovate and bring to market advanced battery technologies that exceed our customers' expectations for outstanding battery performance. To ensure the quality and superior performance of our batteries, Trojan applies the most rigorous testing procedures in the industry to test for cycle life, capacity, charger algorithms and both physical and mechanical integrity. Trojan's battery testing procedures adhere to both BCI and IEC test standards. Trojan's state-of-the-art research and development centers include charger characterization and analytical labs, battery prototype and evaluation labs and battery autopsy centers all dedicated to providing you with a superior battery that you can rely on.



### ***Technical Support and Training***

At Trojan one of our core strengths is the dedication and support we provide to our customers. Trojan's expertise as the world's leading manufacturer of deep-cycle batteries provides us with a unique knowledge and understanding of battery technology in renewable energy applications. We apply this knowledge and expertise to the benefit of our customers by offering outstanding technical support provided by experienced engineers. To assist our customers with in-depth understanding of battery technologies and systems specifications, Trojan offers a range of training services that can be customized according to your application and market focus. These training services range from over-the-phone technical support to two-day training seminars and even on-site training sessions. Customers can earn North American Board of Certified Energy Practitioners (NABCEP) Continuing Education credit through our technical training sessions held at industry trade shows.



### ***Manufacturing Excellence Ensures Product Quality***

Trojan's state-of-the-art manufacturing is just one of the ways we build industry-leading quality into our products. At Trojan we are investing at record levels in manufacturing and production improvement projects at our U.S. facilities. Our recent addition of advanced robotics, state-of-the-art cast-on-strap (COS) technology, automated acid fill stations, and heat seal and testing equipment ensures the overall quality of our products.

With ISO 9001:2008 certified manufacturing plants in California and Georgia, Trojan is dedicated to producing batteries that deliver superior performance, durability and reliability day in and day out.

### ***Reputation Built on Quality, Leadership and Innovation***

Founded in 1925 by co-founders George Godber and Carl Speer, Trojan Battery Company is the world's leading manufacturer of deep-cycle batteries. From deep-cycle flooded batteries to deep-cycle AGM and gel batteries, Trojan has shaped the world of deep-cycle battery technology with more than 85 years of battery manufacturing experience. With the invention of the golf car battery for the Autoette vehicle in 1952, Trojan pioneered the development of deep-cycle battery technology for the golf industry; successfully introducing mobilization to the game of golf. For Trojan, this began a legacy of leadership and innovation that prevails today in the global, deep-cycle markets spanning applications for renewable energy, golf, transportation, floor machines, aerial work platforms, marine and recreational vehicles. Today, Trojan batteries are available worldwide.



Headquartered in Santa Fe Springs, Calif, Trojan's operations include ISO 9001:2008 certified manufacturing plants in the U.S. in California and Georgia and international offices located in Europe, UAE and Asia. Trojan is a proud member of the Alliance for Rural Electrification (ARE), the Solar Electric Power Association (SEPA), the American Solar Energy Society (ASES), the Battery Council International (BCI). We also are a technical research partner with the Bulgarian Academy of Sciences.

# Product Specification Guide / Terminal Configurations

BCI GROUP SIZE	TYPE	VOLTAGE	CAPACITY <sup>A</sup> Amp-Hours (AH)				ENERGY (kWH)		Default TERMINAL	DIMENSIONS <sup>B</sup> Decimals (mm)			WEIGHT lbs. (kg)
			5-Hr Rate	10-Hr Rate	20-Hr Rate	100-Hr Rate	100-Hr Rate	Length		Width	Height <sup>C</sup>		
<b>INDUSTRIAL LINE - DEEP-CYCLE FLOODED BATTERIES - 2,800 CYCLES @ 50% DOD - WITH SMART CARBON™</b>													
N/A	IND9-6V	6 VOLT	365	414	464	601	3.61	14	15.32 (389)	10.24 (260)	23.54 (598)	220 (100)	
N/A	IND13-6V	6 VOLT	545	616	695	902	5.41	14	22.36 (568)	10.34 (263)	23.92 (608)	315 (143)	
N/A	IND17-6V	6 VOLT	727	820	925	1202	7.21	14	27.21 (691)	10.38 (264)	23.73 (603)	415 (188)	
N/A	IND23-4V	4 VOLT	1000	1129	1270	1654	6.62	14	22.38 (568)	10.34 (263)	23.56 (598)	370 (168)	
N/A	IND29-4V	4 VOLT	1274	1448	1618	2105	8.42	14	27.10 (688)	10.35 (263)	23.81 (605)	465 (211)	
N/A	IND27-2V	2 VOLT	1215	1368	1520	1954	3.91	14	15.28 (388)	10.38 (264)	24.00 (610)	228(104)	
N/A	IND33-2V	2 VOLT	1455	1682	1849	2405	4.81	14	17.33 (440)	10.22 (260)	24.01 (610)	278 (125)	
<b>PREMIUM LINE - DEEP-CYCLE FLOODED BATTERIES - 1,600 CYCLES @ 50% DOD - WITH SMART CARBON™</b>													
GC2H	T-105 RE	6 VOLT	185	207	225	250	1.50	5	10.30 (262)	7.11 (181)	11.67 (296)	67 (30)	
903	L16RE-A*	6 VOLT	267	299	325	360	2.16	5	11.67 (296)	6.95 (177)	17.56 (446)	115 (52)	
903	L16RE-B*	6 VOLT	303	340	370	410	2.46	5	11.67 (296)	6.95 (177)	17.56 (446)	118 (54)	
903	L16RE-2V*	2 VOLT	909	1021	1110	1235	2.47	5	11.67 (296)	6.95 (177)	17.56 (446)	119 (54)	
<b>SIGNATURE LINE - DEEP-CYCLE FLOODED BATTERIES - 1,200 CYCLES @ 50% DOD</b>													
N/A	J150	12 VOLT	120	134	150	166	1.99	2	13.70 (348)	7.13 (181)	11.13 (283)	84 (38)	
921	J185P-AC*	12 VOLT	168	189	205	226	2.71	6	14.97 (380)	6.91 (176)	14.71 (374)	114 (52)	
921	J185H-AC*	12 VOLT	185	207	225	249	2.99	6	14.97 (380)	6.91 (176)	14.71 (374)	128 (58)	
GC2	T-605	6 VOLT	175	193	210	232	1.39	1	10.30 (262)	7.11 (181)	11.07 (281)	58 (26)	
GC2	T-105	6 VOLT	185	207	225	250	1.50	1	10.30 (262)	7.11 (181)	11.07 (281)	62 (28)	
GC2	T-125	6 VOLT	195	221	240	266	1.60	1	10.30 (262)	7.11 (181)	11.07 (281)	66 (30)	
GC2H	T-145	6 VOLT	215	239	260	287	1.72	1	10.30 (262)	7.11 (181)	11.90 (302)	72 (33)	
902	J305P-AC*	6 VOLT	271	304	330	367	2.20	6	11.66 (296)	6.94 (176)	14.42 (366)	96 (44)	
902	J305H-AC*	6 VOLT	295	331	360	400	2.40	6	11.66 (296)	6.94 (176)	14.42 (366)	98 (45)	
903	L16P*	6 VOLT	344	386	420	467	2.80	5	11.66 (296)	6.94 (176)	16.74 (425)	114 (52)	
903	L16H*	6 VOLT	357	400	435	483	2.89	5	11.66 (296)	6.94 (176)	16.74 (425)	125 (57)	
<b>SIGNATURE LINE - DEEP-CYCLE FLOODED BATTERIES - 600 CYCLES @ 50% DOD</b>													
24	24TMX	12 VOLT	70	78	85	94	1.13	9	10.92 (277)	6.62 (168)	9.25 (235)	47 (21)	
27	27TMX	12 VOLT	85	97	105	117	1.40	9	12.72 (323)	6.60 (168)	9.24 (235)	55 (25)	
27	27TMH	12 VOLT	95	106	115	128	1.54	9	12.72 (323)	6.60 (168)	9.24 (235)	61 (28)	
30H	30XHS	12 VOLT	105	120	130	144	1.73	9	14.00 (355)	6.73 (171)	10.07 (256)	66 (30)	
<b>AGM LINE - VRLA DEEP-CYCLE BATTERIES - 1,000 CYCLES @ 50% DOD</b>													
U1	U1-AGM	12 VOLT	29	31	33	34	0.408	13	7.78 (198)	5.20 (138)	6.75 (171)	27 (12)	
22	22-AGM	12 VOLT	43	47	50	52	0.624	13	8.96 (228)	5.49 (139)	8.04 (204)	40 (18)	
24	24-AGM	12 VOLT	67	70	76	84	1.01	6	10.77 (274)	6.84 (174)	8.62 (219)	54 (24)	
27	27-AGM	12 VOLT	77	82	89	99	1.19	6	12.05 (306)	6.84 (174)	9.32 (237)	64 (29)	
31	31-AGM	12 VOLT	82	92	100	111	1.33	6	13.73 (349)	6.80 (173)	9.16 (233)	69 (31)	
GC12	12-AGM	12 VOLT	112	127	140	144	1.72	13	13.54 (344)	6.76 (172)	10.88 (276)	100 (45)	
<b>GEL LINE - VRLA DEEP-CYCLE BATTERIES - 1,000 CYCLES @ 50% DOD</b>													
24	24-GEL	12 VOLT	66	72	77	85	1.02	6	10.92 (277)	6.61 (168)	9.26 (235)	52 (24)	
27	27-GEL	12 VOLT	76	84	91	100	1.20	7	12.73 (323)	6.38 (162)	9.26 (235)	63 (29)	
31	31-GEL	12 VOLT	85	94	102	108	1.30	7	12.94 (329)	6.82 (173)	9.64 (245)	70 (32)	
DIN	55HP-GEL	12 VOLT	110	115	125	137	1.64	8	13.53 (344)	6.72 (171)	10.99 (279)	85 (39)	
8D	8D-GEL	12 VOLT	188	207	225	265	3.18	5	20.69 (526)	10.95 (278)	10.82 (275)	163(73)	
GC2	6V-GEL	6 VOLT	154	167	189	198	1.19	6	10.25 (260)	7.08 (180)	10.82 (275)	68 (31)	
DIN	TE35-GEL	6 VOLT	180	193	210	220	1.32	8	9.62 (244)	7.49 (190)	10.70 (272)	69 (31)	



\* Polygon™ Case



A. The amount of amp-hours (AH) a battery can deliver when discharged at a constant rate at 80°F (27°C) for the 20-Hour and 100-Hour rates and 86°F (30°C) for the 5-Hour rate and maintain a voltage above 1.75 V/cell. Capacities are based on peak performance.  
 B. Dimensions are based on nominal size. Dimensions may vary depending on type of handle or terminal. Batteries to be mounted with .5 inches (12.7 mm) spacing minimum.  
 C. Dimensions taken from bottom of the battery to the highest point on the battery. Heights may vary depending on type of terminal.

■ TE35-GEL and 55HP-GEL are not UN2800 certified

# Clean energy for life™



## Environmental Stewardship

At Trojan Battery, when we say, "Clean energy for life™," we mean every word. As proactive supporters of environmental sustainability, our environmental stewardship focuses on clean energy initiatives and recycling programs.

- Trojan batteries are 97% recyclable. The container plastic, battery lead and electrolyte from old deep-cycle batteries can be recycled to produce new deep-cycle batteries.
- Through its partnership with Southern California Edison (SCE) Trojan saves more than 8 million kilowatt hours and cuts CO2 emissions by over 12 million pounds significantly reducing our annual energy consumption and carbon foot print.



## ISO Certification



Trojan batteries are available worldwide.

We offer outstanding technical support, provided by full-time application engineers.

**call 800.423.6569 or + 1.562.236.3000 or visit [www.trojanbatteryRE.com](http://www.trojanbatteryRE.com)**

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