genesis™

PURELEAD

# SELECTION GUIDE

FIFTH EDITION

EnerSys™

Power/Full Solutions

ISO 9000™

Publication No: US-GPL-SG-002 - July 2006

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## TABLE OF CONTENTS

**Company background**

EnerSys 2
Services and applications 3
Features and benefits 4

**Technical information**

Capacity as a function of temperature 5
State of charge 6
Storage time as a function of temperature 6
Voltage regulations 6
Charging recommendations 6

**GENESIS Batteries**

GENESIS product family 7
EP performance specifications 8
EP mechanical specifications 8
70EP performance specifications 9
70EP mechanical specifications 9
GENESIS constant current (CC) and constant power (CP) discharge graphs 10

**Quick reference list**

Standard product listing 11

*EnerSys' Warrensburg plant covers 320,000 square feet and is situated on 33 acres*

EnerSys™ is the world's largest industrial battery manufacturer with manufacturing and assembly plants located around the world, over 7,000 employees, and a worldwide sales and distribution network. A leader in both valve-regulated and flooded lead acid battery technologies, EnerSys is a major supplier to telecommunications, uninterrupted power supply (UPS), data processing, electronic, defense, aviation, and material handling markets across the globe.

EnerSys operates several of the first lead acid battery plants in the United States to receive the ISO 9001 certificates of registration, covering the company's product design, manufacturing, assembly, and customer service functions.

ISO 9001 certification, covering 20 key elements, assures customers that EnerSys has fully documented and implemented manufacturing and quality systems that are consistently followed.

EnerSys' environmentally progressive Warrensburg, Missouri plant, home base of the GENESIS™ product lines, covers 320,000 square feet on 33 acres and employs more than 400 people. EnerSys was the first battery company in the United States to receive ISO 14001 certification. ISO 14001 focuses on the environmental management system of the business and provides a systematic approach to resource conservation.

EnerSys supports its customers through global field sales offices and a select network of authorized Value Added Centers and international representatives and distributors. EnerSys offers technical support and customer service unparalleled in the industry. Additionally, the sales and support team is committed to meeting and exceeding the individual needs of each customer.



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## Value-Added Services

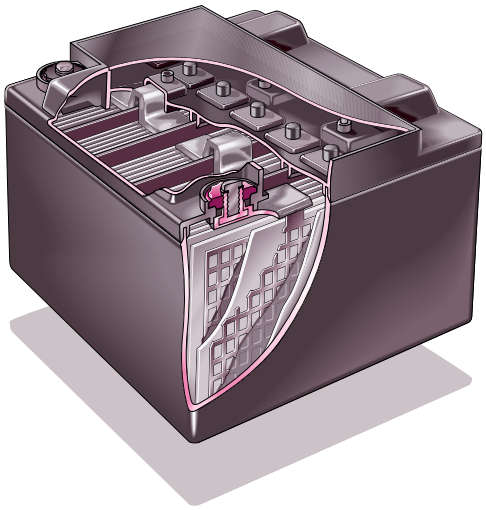
In addition to our manufacturing capability, EnerSys is proud to provide its customers with the following services:

- customized manufacturing design
- battery recycling
- on-line Internet technical information
- charging support
- product testing
- on-site technical seminars
- battery samples
- application engineering
- technical documentation

## Applications

Batteries from EnerSys' "pure lead-tin" family are used in a wide variety of standby and portable/cyclic applications including those in:

- telecommunications
- electronics
- uninterruptible power supplies
- defense installations
- computer back-up
- electric vehicles
- medical equipment
- solar power
- lawn and garden equipment



## Features and Benefits

Sealed pure-lead cells were invented by a predecessor company of EnerSys in 1973. The purity of the materials used is key to supporting the GENESIS battery's performance benefits. A longer service life, meaning fewer replacements and the cost associated with it, combined with higher reliability and fewer system failures, result in a lower long-term cost of ownership to the end user or equipment owner.

What are the advantages of EnerSys technology?

1. **Power density -** Per unit weight, the power provided by pure lead-tin products offers the greatest high-rate power density for your energy dollar. GENESIS' greater volumetric power allows engineers to consider more energy-supporting features or design smaller, lighter packages.

   At high-rate and pulse discharges, EnerSys' GENESIS products offer the best performance value when compared with competitive product in applications at less than 100 minutes of discharge.

2. **Cycle life -** Compared to competitive lead products (offering up to 200 full cycles), pure lead-tin batteries provide 50% to 200% greater full cycle capability. GENESIS product will deliver up to 400 cycles (80% DOD, C/5). And, because GENESIS incorporates a high vent-pressure design, EnerSys' products experience no "dry out" failure mode from repeated recharges.

3. **Float life -** Conventional sealed-lead batteries vary greatly in specified standby life: from three to six years at 20°C, C/20. GENESIS, however, offer a ten-year design life at 25°C, C/5, to 80% of rated capacity. At 20° C, GENESIS Single Cells offer a fifteen-year design life.

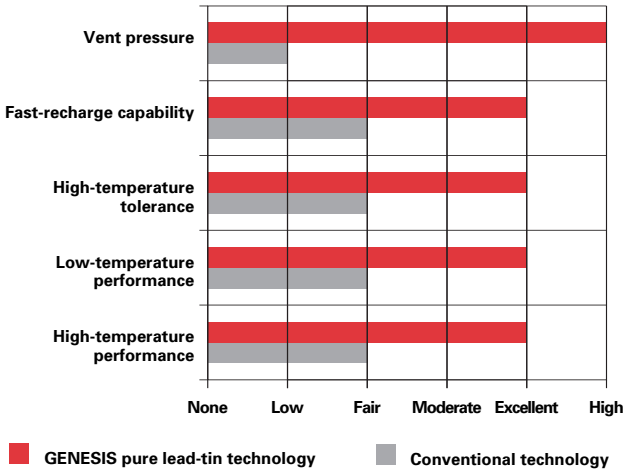
4. **High stable voltage delivery -** The high stable voltage delivery of a pure lead-tin battery results from its low internal resistance. The flat discharge voltage profile of our batteries, similar to nickel cadmium, combined with our products' low internal resistance, means our batteries are able to discharge and recharge their power more quickly and efficiently and offer greater application flexibility. The pure lead-tin construction also gives more watts-per-unit weight at high discharge rates.

5. **Widest temperature range -** Due to the product's strong construction and high vent pressures, these batteries will maintain their performance and physical parameters in extreme conditions. At high temperatures, the chemical reaction in a battery that causes aging is accelerated. Pure lead-tin technology resists that chemical reaction more effectively than alloyed lead, thus allowing a battery to have a longer service life. At high temperatures, when conventional lead batteries experience internal moisture loss from venting and case side wall distention, the GENESIS, with its steel can (metal jacket) and high venting pressure, does not experience these life-robbing conditions. GENESIS has twice the delivered capacity of conventional sealed-lead batteries at temperatures below -20°C, offering unparalleled low-temperature performance.

   GENESIS electrodes are thinner, allowing more electrodes per cell, and therefore greater electrode surface area than conventional sealed-lead, thick electrode batteries. As a result, our batteries can reach a high state of charge in fast-charging applications in one-fourth the time of conventional, sealed-lead, thick-plate batteries. This is 50% to 100% overall better performance for your energy dollar.

6. **Rugged construction -** Due to their strong external packaging and internal pure lead-tin composition, EnerSys' products can withstand not only extreme temperatures but also harsh usage.

## The pure lead-tin advantage




GENESIS external case for the EP product is constructed from UL 94V-0 rated non-halogenated flame-retardant materials. GENESIS products are shock and vibration resistant, designed to offer higher tolerance levels to meet demanding applications, including those in commercial and outdoor applications. The company's focus on battery-case integrity and high vent pressure, coupled with pure lead-tin's low grid-corrosion rate, means GENESIS provide the longest service life possible.

7. **Fastest recharge -** EnerSys' pure lead-tin chemistry allows GENESIS to offer the shortest recharge efficiency of any sealed-lead battery on the market. With pure lead-tin, you can achieve a 95% state of recharge in less than one hour - without loss of capacity or electrolyte using conventional constant-voltage charging techniques.

   Flexible charging options are possible with GENESIS, as no current limit is required when using a constant voltage charger.

8. **Orientation/placement/transport -** Due to the products' mechanical design, GENESIS can be mounted and operated in any position, except inverted, an attractive feature for less accessible areas.

   GENESIS offer UL94 V-0 non-halogenated flame-retardant packaging, thus allowing the mounting of systems in sensitive areas and human environments.

   GENESIS products are classified as "nonspillable batteries", and are excepted from the Department of Transportation's comprehensive packaging requirements if the following conditions are satisfied: (1) The battery is protected against short circuits and is securely packaged and (2) The battery and outer packaging must be plainly and durably marked "NONSPILLABLE" or "NONSPILLABLE BATTERY". GENESIS shipments from EnerSys Warrensburg location, will be properly labeled in accordance with applicable regulations. **Packaging changes performed at other locations may require additional labeling, since in addition to the battery itself containing the required marking, the outer packaging of the battery must also contain the required marking: "NONSPILLABLE" or "NONSPILLABLE BATTERY".**

   GENESIS batteries have been tested and determined to be in compliance with the vibration and pressure differential tests contained in 49 CFR § 173.159(d).

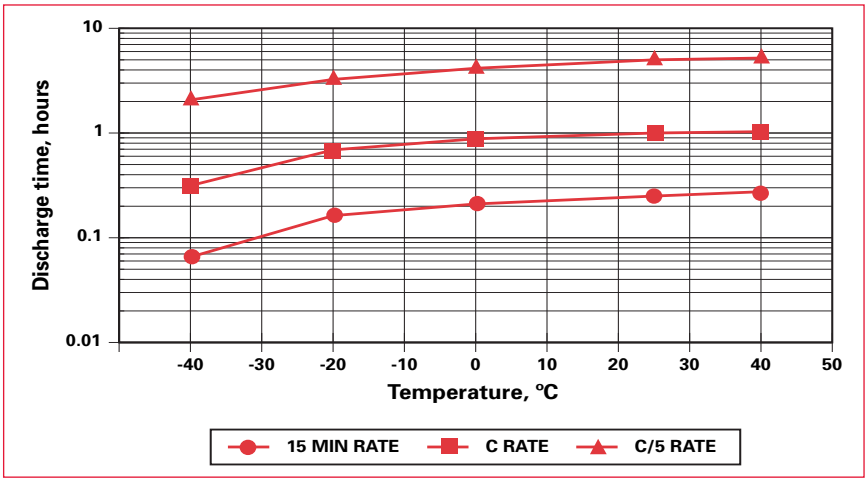
   Because GENESIS are classified as "Nonspillable" and meet the conditions from § 173.159(d) they do not have an assigned UN number nor do they require additional DOT hazard labeling.

   All batteries that have been tested and determined to be in compliance with the DOT Hazardous Material Regulations, the International Civil Aeronautics Organization (ICAO), and the International Air Transport Association (IATA) Packaging Instruction 806 and Special Provision A67, are therefore exempt from all other requirements of these regulations and classified as a "nonspillable battery".

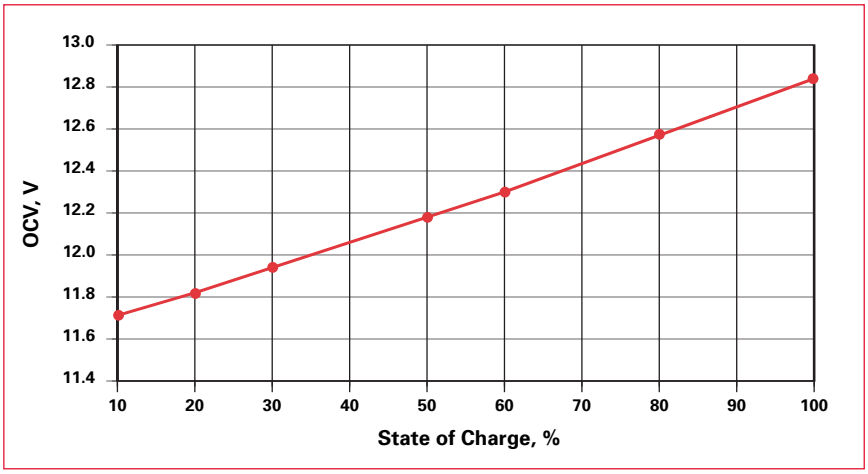
9. **Shelf life -** Pure lead-tin batteries have an extremely low self-discharge rate, thus providing extended storage capability while maintaining high state-of-charge levels for dependable operation.

   GENESIS has a shelf life more than two times that of conventional lead batteries. To assure maximum reliability, EnerSys recommends that all stored cells/batteries be recharged (boost charged) once every 24 months or when the open circuit voltage drops to 12.00 volts per battery, whichever occurs earlier. Inventory should be checked more frequently if storage temperature regularly exceeds 25°C.

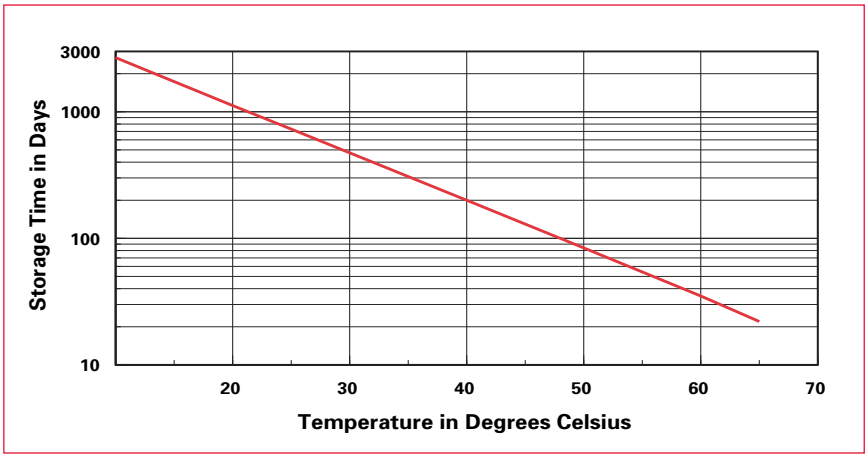
**Capacity as a function of temperature for GENESIS Batteries**



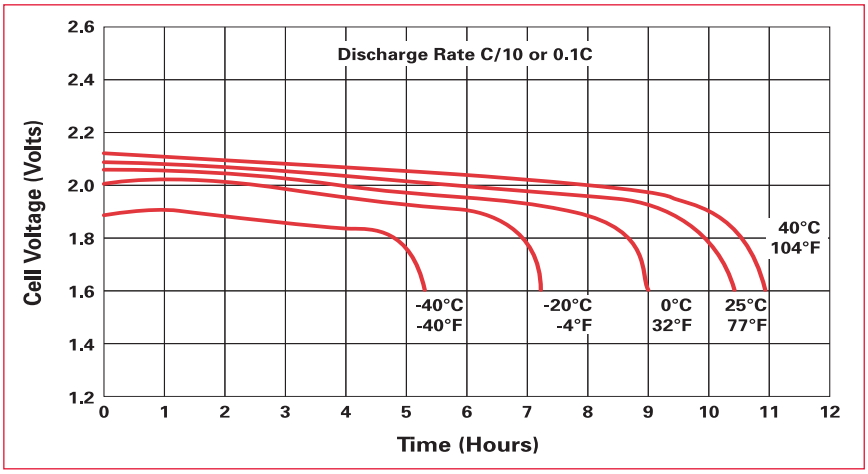
**State of charge for GENESIS batteries**




**Storage time as a function of temperature for GENESIS batteries (Fully charged battery)**




**Voltage regulation for GENESIS batteries**




## Charging recommendations:

Broadly speaking, a battery may be recharged using either a constant voltage (CV) charger or a constant current (CC) charger, or a modification of either or both of these.

The exact regime chosen generally depends upon the time and economic constraints imposed by the system. Constant current charging is widely used in cyclic applications where a recharge must be accomplished in a relatively short time period. Constant voltage charging, where a single voltage level is applied across the battery terminals, is the most suitable method to recharge GENESIS products. Depending on the CV charger's current limit, it is possible to recharge these batteries from a 100% discharged condition to better than 95% state of charge in less than one hour, using only the cyclic charge voltage.

### Constant voltage charging

Constant voltage (CV) charging should be within the following ranges:

Fast Chargers, 12 volts:
14.7 to 15.0 volts @ 25°C

Float Chargers, 12 volts:
13.5 to 13.8 volts @ 25°C

To avoid thermal runaway in warmer temperatures, and to improve charge acceptance in colder temperatures, the charger voltage should be compensated by approximately 18 millivolts per battery per degree centigrade variance from 25°C. This is a negative coefficient, with the voltage being lowered as the temperature increases, and vice versa.

There is no need to limit the inrush current to the battery during the initial phase of constant voltage charging. The low internal resistance of GENESIS batteries allows for large inrush current without damage.

Since not all of the charge returned is accepted to replenish the electro-chemical potential, a good rule of thumb to use is that the charge returned should be 105% to 110% of the capacity delivered on the previous discharge.

Most current waveforms are not pure DC nor are they pure sine waves. Therefore, *consult the EnerSys Application Support Department* for assistance when evaluating the charger current waveforms for your specific application.

## GENESIS product family (All capacities at 10 hr. rate 25°C to 1.67Vpc)

### GENESIS EP:

| Products | Capacity | Part Number | Internal res. of fully charged cell mΩ @ 25°C | Nominal short circuit current for charged battery | DIMENSIONS | | | | | | | | Brass Terminal (metric) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Length | | Width | | Height | | Weight | | |
| | | | | | in. | mm | in. | mm | in. | mm | lb. | kg | |
| G13EP | 13Ah | 0770-2007 | 8.5 | 1,400A | 6.910 | 175.51 | 3.282 | 83.36 | 5.113 | 129.87 | 10.8 | 4.9 | M6 w/ss hardware |
| G13EPX | 13Ah | 0770-2003 | 8.5 | 1,400A | 6.998 | 177.75 | 3.368 | 85.55 | 5.165 | 131.19 | 12.0 | 5.4 | M6 w/ss hardware |
| G16EP | 16Ah | 0769-2007 | 7.5 | 1,600A | 7.150 | 181.61 | 3.005 | 76.33 | 6.605 | 167.77 | 13.5 | 6.1 | M6 w/ss hardware |
| G16EPX | 16Ah | 0769-2003 | 7.5 | 1,600A | 7.267 | 184.58 | 3.107 | 78.92 | 6.666 | 169.32 | 14.7 | 6.7 | M6 w/ss hardware |
| G26EP | 26Ah | 0765-2001 | 5.0 | 2,400A | 6.565 | 166.75 | 6.920 | 175.77 | 4.957 | 125.91 | 22.3 | 10.1 | M6 w/ss hardware |
| G26EPX | 26Ah | 0765-2003 | 5.0 | 2,400A | 6.636 | 168.55 | 7.049 | 179.04 | 5.040 | 128.02 | 23.8 | 10.8 | M6 w/ss hardware |
| G42EP | 42Ah | 0766-2001 | 4.5 | 2,600A | 7.775 | 197.49 | 6.525 | 165.74 | 6.715 | 170.56 | 32.9 | 14.9 | M6 w/ss hardware |
| G42EPX | 42Ah | 0766-2003 | 4.5 | 2,600A | 7.866 | 199.80 | 6.659 | 169.14 | 6.803 | 172.80 | 35.1 | 15.9 | M6 w/ss hardware |
| G70EP | 70Ah | 0771-2001 | 3.5 | 3,500A | 13.020 | 330.71 | 6.620 | 168.15 | 6.930 | 176.02 | 53.5 | 24.3 | M6 w/ss hardware |
| G70EPX | 70Ah | 0771-2003 | 3.5 | 3,500A | 13.020 | 330.71 | 6.620 | 168.15 | 6.930 | 176.02 | 56.0 | 25.4 | M6 w/ss hardware |

*X denotes metal jacket design for extreme duty*

## GENESIS EP performance specifications

### Constant current discharge/amps to 1.67Vpc @ 25°C

| | DURATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Products** | **5 min** | **10 min** | **15 min** | **30 min** | **60 min** | **90 min** | **5 hr** | **8 hr** | **10 hr** | **20 hr** |
| G13EP (13Ah) | 70.8 | 43.6 | 32.2 | 18.6 | 10.4 | 7.3 | 2.5 | 1.6 | 1.3 | .7 |
| G16EP (16Ah) | 90.0 | 54.8 | 40.1 | 23.0 | 12.7 | 8.9 | 3.0 | 2.0 | 1.6 | .8 |
| G26EP (26Ah) | 143.4 | 90.7 | 67.4 | 39.0 | 21.7 | 15.1 | 5.0 | 3.2 | 2.6 | 1.4 |
| G42EP (42Ah) | 212.0 | 138.4 | 104.1 | 60.8 | 33.8 | 23.5 | 7.9 | 5.1 | 4.2 | 2.3 |

### Constant current discharge/watts per cell to 1.67Vpc @ 25°C

| | DURATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Products** | **5 min** | **10 min** | **15 min** | **30 min** | **60 min** | **90 min** | **5 hr** | **8 hr** | **10 hr** | **20 hr** |
| G13EP (13Ah) | 758.4 | 481.8 | 361.2 | 231.6 | 121.2 | 85.8 | 29.4 | 19.2 | 15.6 | 8.4 |
| G16EP (16Ah) | 975.6 | 609.6 | 453.6 | 264.6 | 190.2 | 105.0 | 36.0 | 23.4 | 19.2 | 10.2 |
| G26EP (26Ah) | 1532 | 995 | 751 | 444 | 251 | 175.8 | 59 | 38 | 31 | 16 |
| G42EP (42Ah) | 2291 | 1540 | 1173 | 698 | 394 | 276 | 94 | 62 | 51 | 28 |

### Charging/Temperature/Life:

| | CHARGING PER CELL | | TEMPERATURE RANGE | | LIFE EXPECTANCY | |
|---|---|---|---|---|---|---|
| **Products** | **Cyclic** | **Float** | **Storage & discharge** | **Charge** | **C/5 Cycle life 100% DOD** | **Float life at 25°C (20°C)** |
| G13EP, G16EP<br>G26EP & G42EP | CV 14.7-15.0<br>CC* | CV 13.5-13.8<br>CC* | -40°C to +45°C | -40°C to +45°C | 400 | 10 years<br>(15 years) |
| G13EPX, G16EPX<br>G26EPX & G42EPX | CV 14.7-15.0<br>CC* | CV 13.5-13.8<br>CC* | -40°C to +60°C | -40°C to +60°C | 400 | 10 years<br>(15 years) |

***Maximum recommended storage time before recharge*** *- 24 months @ 25°C or 2.0Vpc, whichever is earlier*

***Atmospheric pressure range*** *- Vacuum to 2 atmospheres*

***Terminal attachment torque for G13EP & G16EP*** *- 50 in.-lbs (5.6 nm)*

***Terminal attachment torque for G26EP & G42EP*** *- 60 in.-lbs (6.8 nm)*

**Users planning to use CC should consult the EnerSys Application Support Department*

## GENESIS EP mechanical specifications (A, B & C - Maximum)

| | DIMENSIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Products** | **A** | | **B** | | **C** | | **D** | | **E** | | **Weight** | |
| | **in.** | **mm** | **in.** | **mm** | **in.** | **mm** | **in.** | **mm** | **in.** | **mm** | **lb.** | **kg** |
| G13EP | 6.910 | 175.51 | 3.282 | 83.36 | 5.113 | 129.87 | 5.56 | 141.2 | 0.81 | 20.6 | 10.8 | 4.9 |
| G13EPX | 6.998 | 177.75 | 3.368 | 85.55 | 5.165 | 131.19 | 5.56 | 141.2 | 0.81 | 20.6 | 12.0 | 5.4 |
| G16EP | 7.150 | 181.61 | 3.005 | 76.33 | 6.605 | 167.77 | 5.74 | 145.8 | 0.67 | 16.9 | 13.5 | 6.1 |
| G16EPX | 7.267 | 184.58 | 3.107 | 78.92 | 6.666 | 169.32 | 5.74 | 145.8 | 0.67 | 16.9 | 14.7 | 6.7 |
| G26EP | 6.565 | 166.75 | 6.920 | 175.77 | 4.957 | 125.91 | 0.64 | 16.3 | 1.06 | 27.0 | 22.3 | 10.1 |
| G26EPX | 6.636 | 168.55 | 7.049 | 179.04 | 5.040 | 128.02 | 0.69 | 17.5 | 1.11 | 28.2 | 23.8 | 10.8 |
| G42EP | 7.775 | 197.49 | 6.525 | 165.74 | 6.715 | 170.56 | 0.74 | 18.8 | 0.87 | 22.0 | 32.9 | 14.9 |
| G42EPX | 7.866 | 199.80 | 6.659 | 169.14 | 6.803 | 172.80 | 0.79 | 20.1 | 0.91 | 23.2 | 35.1 | 15.9 |

**UL Recognized Component. Meets UL 1989**

Caution: Batteries contain toxic materials (Pb and $H_2SO_4$) • Avoid short circuit • Do not charge in gas-tight container

Sealed-lead rechargeable battery must be recycled or disposed of properly. Contact EnerSys Customer Service for details.

## GENESIS 70EP performance specifications

### Constant current discharge/amps to 1.67Vpc @ 25°C

| | DURATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Products** | **5 min** | **10 min** | **15 min** | **30 min** | **60 min** | **90 min** | **5 hr** | **8 hr** | **10 hr** | **20 hr** |
| G70EP (70Ah) | 342.4 | 228.5 | 173.4 | 102.5 | 57.4 | 40.6 | 13.4 | 8.7 | 7.1 | 3.9 |

### Constant power discharge/watts per battery to 1.67Vpc @ 25°C

| | DURATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Products** | **5 min** | **10 min** | **15 min** | **30 min** | **60 min** | **90 min** | **5 hr** | **8 hr** | **10 hr** | **20 hr** |
| G70EP (70Ah) | 3680 | 2519 | 1940 | 1173 | 670 | 486 | 161 | 105 | 86 | 47 |

### Charging/Temperature/Life:

| | CHARGING PER CELL | | TEMPERATURE RANGE | | LIFE EXPECTANCY | |
|---|---|---|---|---|---|---|
| **Products** | **Cyclic** | **Float** | **Storage & discharge** | **Charge** | **C/5 Cycle life 100% DOD** | **Float life at 25°C (20°C)** |
| G70EP | CV 14.7-15.0<br>CC* | CV 13.5-13.8<br>CC* | -40°C to +45°C | -40°C to +45°C | 400 | 10 years<br>(15 years) |
| G70EPX | CV 14.7-15.0<br>CC* | CV 13.5-13.8<br>CC* | -40°C to +60°C | -40°C to +60°C | 400 | 10 years<br>(15 years) |

***Maximum recommended storage time before recharge*** *- 24 months @ 25°C or 2.0Vpc, whichever is earlier*

***Atmospheric pressure range*** *- Vacuum to 2 atmospheres*

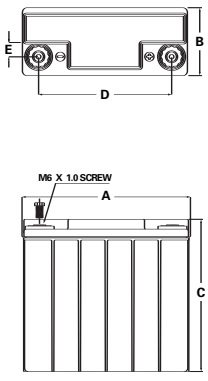
***Terminal attachment torque for G70EP*** *- 60 in.-lbs (6.8 nm)*

**Users planning to use CC should consult the EnerSys Application Support Department*

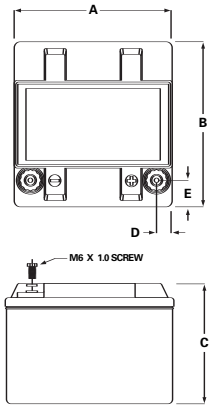
## GENESIS 70EP mechanical specifications (A, B & C - Maximum)

| | DIMENSIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Products** | **A** | | **B** | | **C** | | **D** | | **E** | | **Weight** | |
| | **in.** | **mm** | **in.** | **mm** | **in.** | **mm** | **in.** | **mm** | **in.** | **mm** | **lb.** | **kg** |
| G70EP | 13.020 | 330.71 | 6.620 | 168.15 | 6.930 | 176.02 | 9.69 | 246.13 | 2.45 | 62.23 | 53.5 | 24.3 |
| G70EPX | 13.020 | 330.71 | 6.620 | 168.15 | 6.930 | 176.02 | 9.69 | 246.13 | 2.45 | 62.23 | 56.0 | 25.4 |

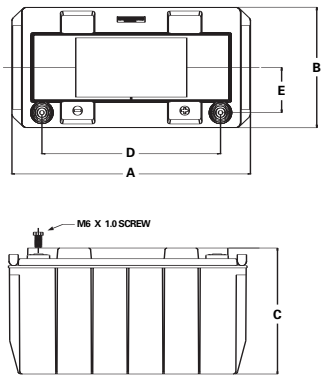
### G13EP - G16EPX




### G26EP - 42EPX




### G70EP & G70EPX



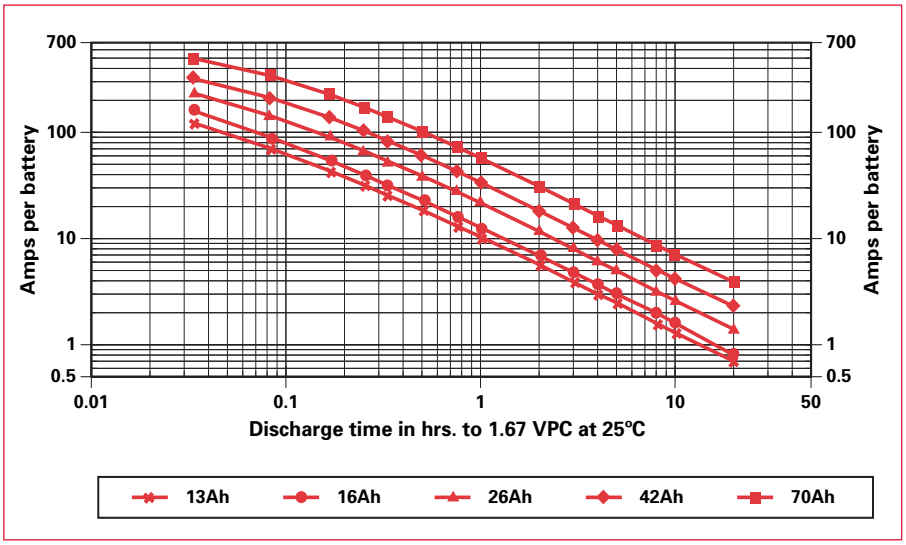

All shown without metal jacket

**UL Recognized Component. Meets UL 1989**

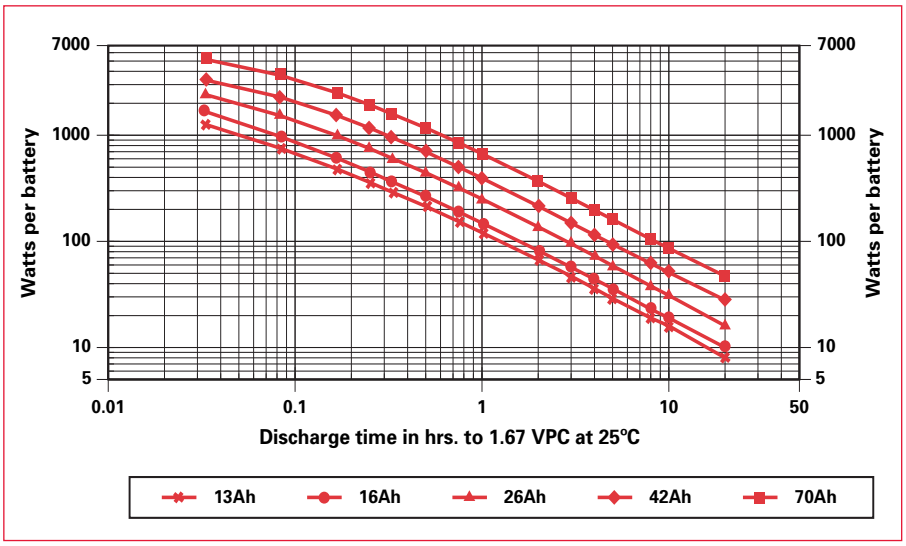
Caution: Batteries contain toxic materials (Pb and $H_2SO_4$) • Avoid short circuit • Do not charge in gas-tight container

Sealed-lead rechargeable battery must be recycled or disposed of properly. Contact EnerSys Customer Service for details.

## GENESIS constant current (CC) discharge




## GENESIS constant power (CP) discharge



## ENERSYS STANDARD PRODUCT LIST

**GENESIS EP Batteries**

| PART NUMBER | DESCRIPTION | VOLTAGE | 10 Hr RATE | PERFORMANCE SPECIFICATIONS | MECHANICAL SPECIFICATIONS |
|---|---|---|---|---|---|
| 0770-2007 | G13EP (13Ah) | 12V | 13Ah | Page 8 | Page 8 |
| 0770-2003 | G13EPX (13Ah) | 12V | 13Ah | Page 8 | Page 8 |
| 0769-2007 | G16EP (16Ah) | 12V | 16Ah | Page 8 | Page 8 |
| 0769-2003 | G16EPX (16Ah) | 12V | 16Ah | Page 8 | Page 8 |
| 0765-2001 | G26EP (26Ah) | 12V | 26Ah | Page 8 | Page 8 |
| 0765-2003 | G26EPX (26Ah) | 12V | 26Ah | Page 8 | Page 8 |
| 0766-2001 | G42EP (42Ah) | 12V | 42Ah | Page 8 | Page 8 |
| 0766-2003 | G42EPX (42Ah) | 12V | 42Ah | Page 8 | Page 8 |
| 0771-2001 | G70EP (70Ah) | 12V | 70Ah | Page 9 | Page 9 |
| 0771-2003 | G70EPX (70Ah) | 12V | 70Ah | Page 9 | Page 9 |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