

# LEAD ACID SMF12V BATTERY SERIES

## I. Battery Structure

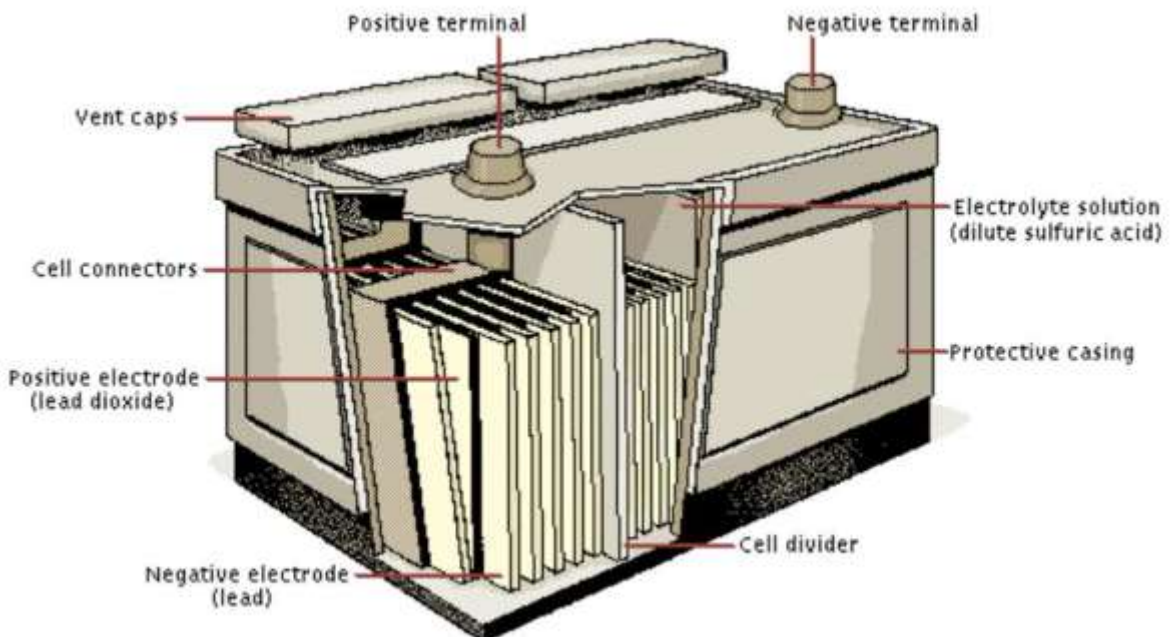
- Connector Relief Valve
- Negative Terminal
- Positive Electrode
- Negative Electrode
- Pole Separator
- Positive Plate Negative Plate Positive Terminal
- Top Cover / Cover / Battery case

## II. Inside a Lead Acid Battery

*HEXATRON TECHNOLOGY* 12volt lead acid battery is actually made up of six identical 2volt cells. Each cell contains lead plates of different compositions sitting in dilute sulphuric acid. Lead dioxide plates (linked to the positive terminal of the battery) react with the acid to form lead sulphate giving up electrons (leaving the plate positive).

The pure lead plates (linked to the negative terminal of the battery) react with the sulphate ions to also form lead sulphate. The pure lead plates therefore supply two positive charges and so are left negative. The passage of electrons from the lead oxide plates to the pure lead plates is the current of electricity generated by the cell which can be used. When the battery is recharged, the lead sulphate in each cell is broken down resulting in lead dioxide being re deposited on the positive electrode, and lead being replaced on the negative electrode.

***Lead acid battery schematic diagram follows with more information below.***



**Positive Plate** a kind of high tin lead-calcium grid Electrodes with porous rate lead dioxide as active substance.

**Negative Plate** a kind of lead-calcium grid Electrodes with spongy lead as active substance.

**Electrolyte** a kind of dilute sulfuric acid, involved in chemical reaction and transmitting electrician during charging and discharging of the battery.

**Separator** made of non-woven structural benign glass fiber cotton, lagging electrolyte, isolating the positive and negative in case of short circuit. Its chemical properties are very stable in dilute sulfuric acid electrolyte and it is character by high hole rate, small aperture, low resistance.

**Relief Valve** a kind of non-return valve made of rubber material. If the battery is charged wrong, charger is faulty or other anomalies happen, which lead to battery overcharged and produce a large amount of gas, the valve will open to discharge excessive gas, maintain the air pressure within the prescribed range (5~45kpa). In the normal condition, the valve is closed to prevent outside air from entering in case of reaction between oxygen and the negative active substance.

**Positive and Negative Terminals** according to different types of batteries, there are small short prominent tip, latch-type, screw-shaped or lead-type terminals. Battery leak proofness is realized with a kind of channel structure which can protect to infuse adhesive and the epoxy adhesives.

### III. Battery Characteristics

<b>Discharge Capacity under different Temperature</b>	40 °C	102%
	25 °C	100%
	0 °C	85%
	-15 °C	65%
<b>Remain capacity after self-discharge (25°C)</b>	3 months later	91%
	6 months later	82%
	12 months later	64%
<b>Expected service life (25°C, 0.25CA)</b>	Cycling	More than 400 times
	Floating charge	More than 4 years

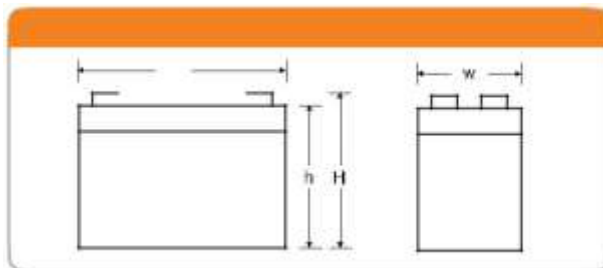
*Note: The above are average data, not the minimum; The data can be obtained in the first 3 charge-discharge cycling.*

### IV. Battery Construction

Component	Positive plate	Negative plate	Container	Cover	Safety valve	Terminal	Separator	Electrolyte
<b>Raw material</b>	Lead dioxide	Lead	ABS	ABS	Si-Rubber	Copper	Fiberglass	Sulfuric acid

## V. PRODUCT RANGE

Model /Ordering Info	Nominal Voltage (V)	Nominal Capacity (AH) 20HR	Length (mm)	Width (mm)	Height (mm)	Overall Height (mm)	Typical Weight (kg)
HTLE12V009	12	9	151	65	95	101	2.40
HTLE12V012	12	12	151	99	95	101	3.40
HTLE12V018	12	18	181	77	167	167	5.50
HTLE12V026	12	26	165	176	125	125	8.20
HTLE12V035	12	35	198	128	174	179	11.50
HTLE12V040	12	40	198	171	174	179	12.50
HTLE12V065	12	65	350	167	178	178	20.50
HTLE12V080	12	80	260	170	230	221	23.10
HTLE12V100	12	100	329	174	214	219	32.00
HTLE12V120	12	120	407	174	226	233	36.20
HTLE12V-150	12	150	486	172	233	233	47.00
HTLE12V-200	12	200	522	240	226	233	65.00



### Characteristics

Nominal Voltage		12V
Nominal Capacity (20 hour rate)		9.0Ah
Capacity 25°C (77°F)	10 hour rate (0.86A)	8.6Ah
	5 hour rate (1.60A)	8.0Ah
	1 hour rate (5.94A)	5.94Ah
Internal Resistance	Full Charged Battery 25°C	≤20m Ω
Capacity affected by Temperature (10 hour)	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C (77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 2.7A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 2.7A Voltage 14.4-15.0V

Nominal Voltage		12V
Nominal Capacity (20 hour rate)		12Ah
Capacity 25°C (77°F)	10 hour rate (1.14A)	11.4Ah
	5 hour rate (2.14A)	10.7Ah
	1 hour rate (7.92A)	7.92Ah
Internal Resistance	Full Charged Battery 25°C	≤14m Ω
Capacity affected by Temperature (10 hour)	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C (77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 3.6A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 3.6A Voltage 14.4-15.0V

Nominal Voltage		12V
Nominal Capacity (20 hour rate)		18Ah
Capacity 25°C(77°F)	10 hour rate (1.62A)	17.2Ah
	5 hour rate (3.03A)	16.2Ah
	1 hour rate (11.2A)	12.2Ah
Internal Resistance	Full Charged Battery 25°C	≤12m Ω
Capacity affected by Temperature (10 hour )	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C(77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 5.1A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 5.1A Voltage 14.4-15.0V

Nominal Voltage		12V
Nominal Capacity (10 hour rate)		26Ah
Capacity 25°C(77°F)	20 hour rate (1.4A)	28Ah
	5 hour rate (4.8A)	24Ah
	1 hour rate (17.3A)	17.3Ah
Internal Resistance	Full Charged Battery 25°C	≤13m Ω
Capacity affected by Temperature (10 hour )	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C(77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 6.5A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 6.5A Voltage 14.4-14.9V

Nominal Voltage		12V
Nominal Capacity (10 hour rate)		40Ah
Capacity 25°C(77°F)	20 hour rate (2.21A)	44.2Ah
	5 hour rate (7.34A)	36.7Ah
	1 hour rate (27.3A)	27.3Ah
Internal Resistance	Full Charged Battery 25 °C	10m
Capacity affected by Temperature (10 hour )	40 °C(104°F)	102%
	25 °C(77°F)	100%
	0 °C(32°F)	85%
	-15 °C(5°F)	65%
Self-Discharge 25 °C(77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25 °C (77°F)	Float	Initial Charging Current Less than 9.5A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 9.5A Voltage 14.4-14.9V

Nominal Voltage		12V
Nominal Capacity (10 hour rate)		65Ah
Capacity 25°C(77°F)	20 hour rate (3.61A)	72.2Ah
	5 hour rate (11.9A)	59.5Ah
	1 hour rate (43.2A)	43.2Ah
Internal Resistance	Full Charged Battery 25°C	≤7.0m Ω
Capacity affected by Temperature (10 hour )	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C(77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 16.3A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 16.3A Voltage 14.4-14.9V



Nominal Voltage		12V
Nominal Capacity (10 hour rate)		80Ah
Capacity 25°C(77°F)	20 hour rate (4.44A)	88.8Ah
	5 hour rate (14.6A)	73Ah
	1 hour rate (53.2A)	53.2Ah
Internal Resistance	Full Charged Battery 25°C	≤6.0mΩ
Capacity affected by Temperature (10 hour )	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C(77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 20.0A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 20.0A Voltage 14.4-14.9V

Nominal Voltage		12V
Nominal Capacity (10 hour rate)		100Ah
Capacity 25°C(77°F)	20 hour rate (5.55A)	111.0Ah
	5 hour rate (18.3A)	91.5Ah
	1 hour rate (66.5A)	66.5Ah
Internal Resistance	Full Charged Battery 25°C	≤5.0mΩ
Capacity affected by Temperature (10 hour )	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C(77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 25.0A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 25.0A Voltage 14.4-14.9V

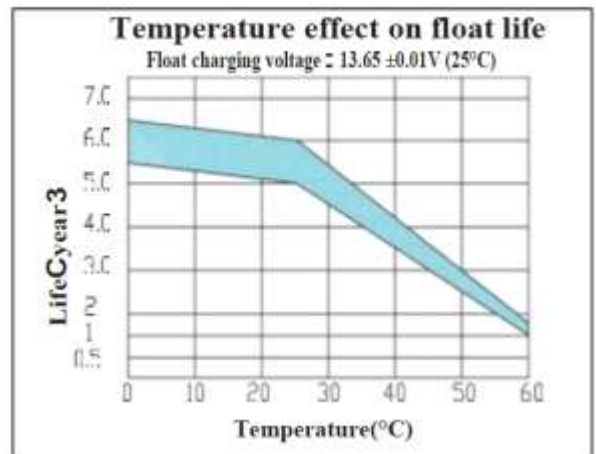
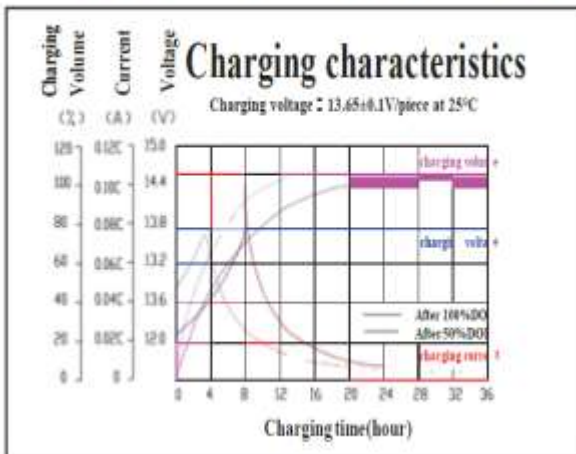
Nominal Voltage		12V
Nominal Capacity (10 hour rate)		120Ah
Capacity 25°C(77°F)	20 hour rate (6.66A)	133.2Ah
	5 hour rate (21.9A)	109.5Ah
	1 hour rate (79.8A)	79.8Ah
Internal Resistance	Full Charged Battery 25°C	≤5.0mΩ
Capacity affected by Temperature (10 hour )	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C(77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 24.0A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 24.0A Voltage 14.4-14.9V

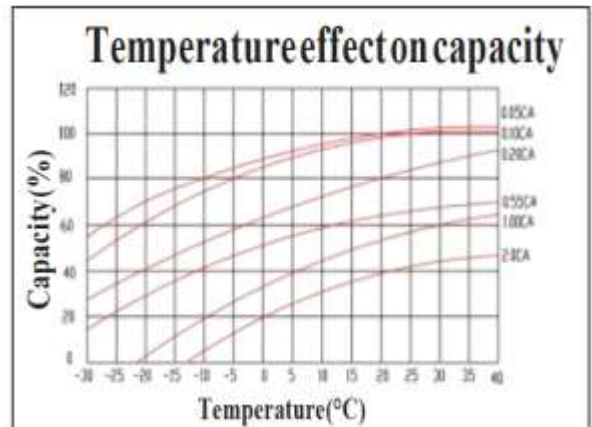
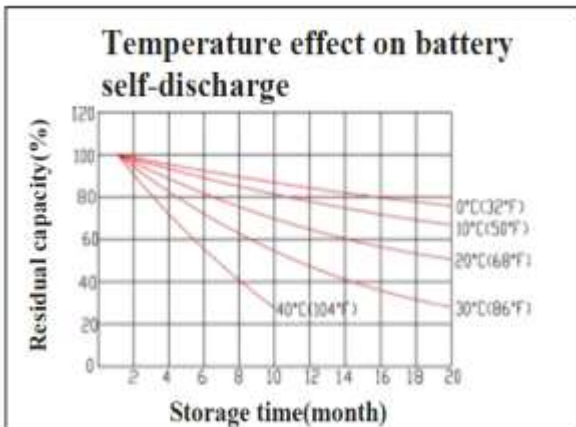
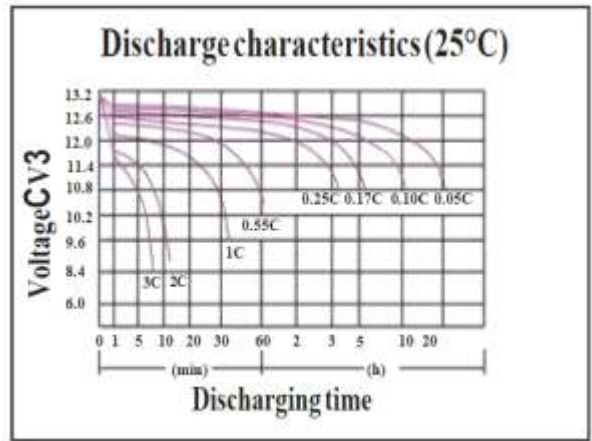
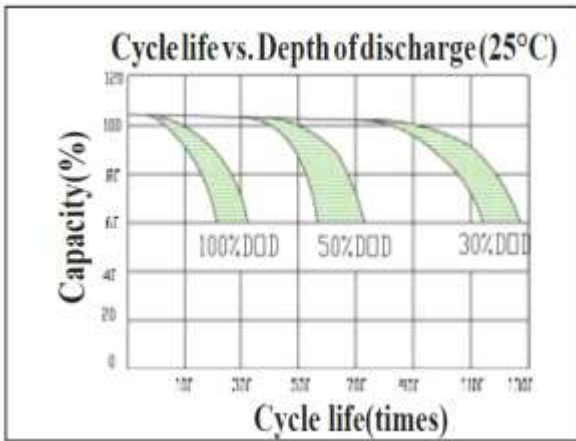
Nominal Voltage		12V
Nominal Capacity (10 hour rate)		150Ah
Capacity 25°C(77°F)	20 hour rate (7.96A)	159.2Ah
	5 hour rate (29.19A)	145.9Ah
	1 hour rate (97.7A)	97.7Ah
Internal Resistance	Full Charged Battery 25°C	≤6.3mΩ
Capacity affected by Temperature (10 hour )	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C(77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 45.0A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 45.0A Voltage 14.4-14.9V

Nominal Voltage		12V
Nominal Capacity (10 hour rate)		200Ah
Capacity 25°C(77°F)	20 hour rate (11.0A)	220Ah
	5 hour rate (35.4A)	177Ah
	1 hour rate (132A)	132Ah
Internal Resistance	Full Charged Battery 25°C	≤2.5mΩ
Capacity affected by Temperature (10 hour)	40°C (104°F)	102%
	25°C (77°F)	100%
	0°C (32°F)	85%
	-15°C (5°F)	65%
Self-Discharge 25°C(77°F) Capacity	after 3 month storage	90%
	after 6 month storage	80%
	after 12 month storage	62%
Charge (Constant Voltage) 25°C (77°F)	Float	Initial Charging Current Less than 40A Voltage 13.6-13.8V
	Cycle	Initial Charging Current Less than 40A Voltage 14.4-14.9V

Specifications	Lead Acid	NiCd	NiMH	Li-Ion <sup>1</sup>		
				Cobalt	Manganese	Phosphate
Specific energy (Wh/kg)	30-50	45-80	60-120	150-250	100-150	90-120
Internal resistance	Very Low	Very low	Low	Moderate	Low	Very low
Cycle life <sup>2</sup> (80% DoD)	200-300	1,000 <sup>3</sup>	300-500 <sup>3</sup>	500-1,000	500-1,000	1,000-2,000
Charge time <sup>4</sup>	6-16h	1-2h	2-4h	2-4h	1-2h	1-2h
Overcharge tolerance	High	Moderate	Low	Low. No trickle charge		
Self-discharge/ month (room temp)	5%	20% <sup>5</sup>	30% <sup>6</sup>	~5% Protection circuit consumes 3%/month		
Cell voltage (nominal)	2V	1.2V <sup>8</sup>	1.2V <sup>8</sup>	3.6V <sup>7</sup>	3.7V <sup>7</sup>	3.2-3.3V
Charge cutoff voltage (V/cell)	2.40 Float 2.25	Full charge detection by voltage signature		4.20 typical Some go to higher V		3.60
Discharge cutoff voltage (V/cell, 1C)	1.75V	1.00V		2.50-3.00V		2.50V
Peak load current Best result	5C <sup>1</sup> 0.2C	20C 1C	5C 0.5C	2C +1C	>30C <15C	>30C <10C
Charge temperature	-20 to 50°C (-4 to 122°F)	0 to 45°C (32 to 113°F)		0 to 45°C <sup>9</sup> (32 to 113°F)		
Discharge temperature	-20 to 50°C (-4 to 122°F)	-20 to 65°C (-4 to 149°F)		-20 to 60°C (-4 to 140°F)		
Maintenance requirement	3-6 months <sup>10</sup> (topping chg.)	Full discharge every 90 days when in full use		Maintenance-free		
Safety requirements	Thermally stable	Thermally stable, fusa protection		Protection circuit mandatory <sup>11</sup>		
In use since	Late 1900s	1950	1990	1991	1996	1999
Toxicity	Very high	Very high	Low	Low		
Coulombic efficiency <sup>12</sup>	~90%	~70% slow charge ~90% fast charge		99%		
Cost	Low	Moderate		High <sup>13</sup>		

## Performance Characteristics





\*Product specifications are subject to change without further notice.

### Quality Control

We ensure highest standards of product quality combined with optimal manufacturing capacity, our QA/QC department performs rigorous quality control on all materials, spare parts and throughout the entire production process to ensure the highest quality of every component.