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THE POWER OF CARBON FOAM

FIREFLY MICROCELL CARBON FOAM BATTERIES

FOR UPS Applications

Solving the Global Problem of Frequent UPS Battery Replacement

Your UPS system may remain in service for many years. The battery bank often does not. Firefly Energy addresses this gap with advanced carbon foam VRLA batteries designed for longer service life, reliable backup performance and reduced replacement frequency.



www.fireflyenergy.com

info@fireflyenergy.com

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INDUSTRY REALITY

Across the global UPS market, one recurring issue creates cost and risk for customers: the UPS electronics may remain in service for many years, but conventional VRLA battery banks usually need replacement much earlier.

7 - 10 yrs

Typical UPS asset life

Industry guidance commonly places most UPS systems around seven to ten years of service life.

3 - 5 yrs

Typical VRLA battery life

Standard sealed/VRLA UPS batteries are commonly expected to need replacement within this range.

1-2x

Battery replacement cycles

Many customers may replace batteries once or twice during the UPS lifetime.

The mismatch creates the business problem



What customers feel

Repeated battery replacement brings site visits, labour, disposal, downtime planning and uncertainty about whether backup time is still available.

What they really want

A battery solution that reduces replacement frequency, supports dependable backup and improves lifecycle value without forcing a full UPS architecture change.

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What Customers Face Today

Regular battery replacement is more than a battery purchase - it is an operational headache.

Frequent replacement

Battery banks often need replacement before the UPS reaches the end of its useful life

Hidden service cost

Removal, installation, testing, commissioning, transport, disposal and site access add cost.

Backup uncertainty

A weak battery may not deliver the expected runtime when the grid fails.

Frequent outages

Repeated discharge and incomplete recharge can accelerate capacity loss in regular batteries.

Maintenance disruption

Replacing batteries across multiple sites consumes manpower and planning time.

Sustainability pressure

More replacement cycles mean more handling, logistics and recycling responsibility

How Firefly Energy Solves This Issue

Developed by scientists at Firefly Energy, Microcell™ Carbon Foam is a material that's revolutionizing the battery industry. Compared to spongy lead negative plates, one of the main components of conventional lead acid batteries, carbon foam Negative plates deliver longer service life, increased energy efficiency and better performance under extreme conditions. That's why we used it to create our revolutionary Firefly MCF battery.

Firefly carbon foam design resists hard sulfation and corrosion, two of the primary causes of failure in lead-acid batteries, while dramatically increasing the surface area in contact with the Active material within the battery, resulting in greater energy capacity, faster recharges, and deeper discharge capability.

Firefly Carbon Foam Batteries are advanced VRLA AGM/Gel batteries developed for demanding backup and cycling applications. They provide the familiar VRLA format customers already understand, with the added performance benefits of carbon foam technology.

The Firefly solution

- More than 3 times cycle life compared to flooded & AGM VRLA batteries at 50% DOD.
- Longer service life compared with conventional VRLA batteries.
- Improved charge acceptance for repeated discharge and recharge conditions.
- Better tolerance in partial state-of-charge operating conditions.
- Maintenance-free sealed VRLA design for UPS cabinets and battery rooms.
- Complete model range for small, medium and large UPS systems.
- Designed to reduce replacement frequency and improve lifecycle value.
- Lowest Cost of ownership and Industry leading warranty.
- Compatible with existing lead acid battery recycling infrastructure.

Positioning: carbon-foam VRLA vs conventional VRLA vs lithium-ion







Attribute that matters	Conventional VRLA lead-acid	Firefly 3D/3D2 (carbon-foam VRLA)	Typical lithium-ion (system level)
Partial-state-of-charge tolerance	Often limited; sulfation risk grows	Designed to resist and reverse sulfation; better PSoC behavior	Generally strong; behavior BMS-managed
Recharge time after event	Moderate to slow at high SOC	Improved fast-recharge behavior via high surface area and low diffusion lengths	Often fast; charger/BMS dependent
Hot environment resilience	Life drops rapidly as temperature rises	Improved thermal transfer; cooler operation	Cell still temperature-sensitive; needs thermal management
Cold discharge power	Large derating; may need oversizing	Higher available power at low temperature	Varies; low-temp charging limits apply
Serviceability and safety	Mature; simple; low incident energy	Same lead-acid safety model; lower runaway risk	Requires BMS; many chemistries need runaway mitigation
End-of-life / circularity	Best-in-class recycling infrastructure	Recyclable in existing lead-acid streams; foam acts as fuel in smelting	Recycling improving but varies by region

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Firefly UPS Battery Range

Multiple models for small UPS systems, commercial backup, telecom, industrial UPS and data centre battery banks.

Firefly Model	Voltage	Capacity	Best Suitable UPS Application
12V 42Ah	12V	42Ah	Small UPS, CCTV, access control, emergency backup
12V 65Ah	12V	65Ah	Office UPS, commercial backup, telecom cabinets
12V 105Ah	12V	100/105Ah	Medium UPS, IT rooms, telecom, industrial backup
12V 150Ah	12V	150Ah	Medium/Larger UPS banks, commercial and industrial backup
4V 450Ah	4V	450Ah	High-capacity UPS banks, data centres, telecom backup
2V 900Ah	2V	900Ah	Large UPS systems, data centres, mission-critical backup

Range positioning

Small UPS
12V 42Ah and 12V 65Ah for compact backup, security, routers and office systems.

Medium UPS
12V 105Ah and 12V 150Ah for IT rooms, telecom and commercial UPS banks.

Large UPS
4V 450Ah and 2V 900Ah for data centres, telecom energy banks and critical infrastructure.

PB UPS 12V 42 Ah (VRLA AGM GEL)

Partial state of charge cycling Efficiency	Ampere-hour >97% & watt hour >90%
Nominal Voltage	12V
Maximum charge voltage	14.10V
Maximum charge current	0.5C Amps for continuous charge 1C Amps can be tolerated for Sporadic sessions.
Internal resistance	8 mΩ
Shelf life@25°C(77°F)	2 years
Self- Discharge	<2% per Month
CCA	210 Amps
Design Float Life	>12 years at 27°C (80.6°F)

Temperature	**Low**	**High**
Operation	-20°C/-4°F	50°C/122°F
Storage	-30°C/-22°F	60°C/140°F

Weights & Dimensions	
Length	7.9in/200mm
Width	6.7in/171mm
Height	6.9in/175 mm
Weight	26.4lbs/12.0kgs
Volume	370Cu.in/6.0liters
Construction	
Terminal Configuration	L TERMINAL
Case/Cover	PPCP
Racks	Available upon request

Discharge Rates to 1.75V Per Cell*			
Hours	**Amps**	**Ah**	**Kwh**
0.25	62	15.5	0.19
1	25.2	25.2	0.31
3	10.7	32.1	0.39
5	7.0	35.0	0.42
10	4.0	40.0	0.48
20	2.1	42.0	0.50

International Compliance
IEC 60896 -21/22 :2004
IEC 61427
IEC 60095
IEC 61056
IS 15549:2005
ISO 9001:2015

Battery Life *	
DOD(%)	**Cycles**
30	7500-11250
50	3000-3500
65	1500-2000
80	850-1100
100	500-700
***All above are at 25°C/77°F**	

Charge Temperature Compensation					
Operating Temperature	°C	-20	25	40	55
	°F	-4	77	104	131
Absorption Charge Voltage	V	15.3	14.1	13.8	13.50

PB UPS 12V 65 Ah (VRLA AGM GEL)

Partial state of charge cycling Efficiency	Ampere-hour >97% & watt hour >90%
Nominal Voltage	12V
Maximum charge voltage	14.10V
Maximum charge current	0.5C Amps for continuous charge 1C Amps can be tolerated for Sporadic sessions.
Internal resistance	6.3 mΩ
Shelf life@25°C(77°F)	2 years
Self- Discharge	<2% per Month
CCA	350 Amps
Design Float Life	>12 years at 27°C (80.6°F)

Temperature	**Low**	**High**
Operation	-20°C/-4°F	50°C/122°F
Storage	-30°C/-22°F	60°C/140°F

Weights & Dimensions	
Length	13.7in/350mm
Width	6.8in/171mm
Height	6.9in/175 mm
Weight	42lbs/19kgs
Volume	610Cu.in/10liters
Construction	
Terminal Configuration	L TERMINAL
Case/Cover	PPCP
Racks	Available upon request

Discharge Rates to 1.75V Per Cell*			
Hours	Amps	Ah	Kwh
0.25	96	24	0.29
1	39	39	0.47
3	16.5	49.5	0.59
5	10.8	54.0	0.65
10	6.2	62.0	0.74
20	3.25	65	0.78

International Compliance
IEC 60896 -21/22 :2004
IEC 61427
IEC 60095
IEC 61056
IS 15549:2005
ISO 9001:2015

Battery Life *	
DOD(%)	Cycles
30	7500-11250
50	3000-3500
65	1500-2000
80	850-1100
100	500-700
***All above are at 25°C/77°F**	

Charge Temperature CompensationCharge Temperature Compensation					
Operating Temperature	°C	-20	25	40	55
	°F	-4	77	104	131
Absorption Charge Voltage	V	15.3	14.1	13.8	13.5

PB UPS 12V 105 Ah (VRLA AGM GEL)

Partial state of charge cycling Efficiency	Ampere-hour >97% & watt hour >90%
Nominal Voltage	12V
Maximum charge voltage	14.10V
Maximum charge current	0.5C Amps for continuous charge 1C Amps can be tolerated for Sporadic sessions.
Internal resistance	5.0 mΩ
Shelf life@25°C(77°F)	2 years
Self- Discharge	<2% per Month @ 25°C
CCA	630 Amps
Design Float Life	>12 years at 27°C (80.6°F)

Temperature	**Low**	**High**
Operation	-20°C/-4°F	50°C/122°F
Storage	-30°C/-22°F	60°C/140°F

Weights & Dimensions	
Length	14.00in/356mm
Width	6.8in/171mm
Height	8.6in/218 mm
Weight	69.5lbs/31.5kgs
Volume	807Cu.in/12.3liters
Construction	
Terminal configuration	3/8 “-16 UNC
Case/Cover	ABS
Racks	Available upon request

Discharge Rates to 1.75V Per Cell*			
Hours	**Amps**	**Ah**	**Kwh**
0.25	155	38.8	0.47
1	63	63	0.76
3	26.7	80	0.96
5	17.4	87	1.04
10	10	100	1.2
20	5.25	105	1.26

International Compliance
IEC 60896 -21/22 :2004
IEC 61427
IEC 60095
IEC 61056
IS 15549:2005
ISO 9001:2015

Battery Life *	
DOD(%)	Cycles
30	7500-11250
50	3000-3500
65	1500-2000
80	850-1100
100	500-700
***All above are at 25°C/77°F**	

Charge Temperature CompensationCharge Temperature Compensation					
Operating Temperature	°C	-20	25	40	55
	°F	-4	77	104	131
Absorption Charge Voltage	V	15.3	14.1	13.8	13.9

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PB UPS 12V 150 Ah (VRLA AGM GEL)

Partial state of charge cycling Efficiency	Ampere-hour >97% & watt hour >90%
Nominal Voltage	12V
Maximum charge voltage	14.10V
Maximum charge current	0.5C Amps for continuous charge 1C Amps can be tolerated for Sporadic sessions.
Internal resistance	3.2 mΩ
Shelf life@25°C(77°F)	2 years
Self- Discharge	<2% per Month
CCA	820 Amps
Design Float Life	>12 years at 27°C (80.6°F)

Temperature	**Low**	**High**
Operation	-20°C/-4°F	50°C/122°F
Storage	-30°C/-22°F	60°C/140°F

Weights & Dimensions	
Length	19.0in/484mm
Width	6.7in/170mm
Height	9.4in/240 mm
Weight	92.4lbs/42kgs
Volume	1196Cu.in/19.7liters
Construction	
Terminal Configuration	3/8 "-16 UNC
Case/Cover	ABS
Racks	Available upon request

Discharge Rates to 1.75V Per Cell*			
Hours	Amps	Ah	Kwh
0.25	221	55.2	0.66
1	90	90.0	1.08
3	38	114	1.37
5	24.8	124	1.49
10	14.3	143	1.71
20	7.5	150	1.80

International Compliance
IEC 60896 -21/22 :2004
IEC 61427
IEC 60095
IEC 61056
IS 15549:2005
ISO 9001:2015

Battery Life *	
DOD(%)	Cycles
30	7500-11250
50	3000-3500
65	1500-2000
80	850-1100
100	500-700
***All above are at 25°C/77°F**	

Charge Temperature CompensationCharge Temperature Compensation					
Operating Temperature	°C	-20	25	40	55
	°F	-4	77	104	131
Absorption Charge Voltage	V	15.3	14.1	13.8	13.5

PB UPS 2V 900 Ah / 4V 450 Ah (VRLA AGM GEL)

Partial state of charge cycling Efficiency	**2 V 900 Ah**	**4V 450 Ah**
	Ampere-hour >97% & Watt-hour> 90 %	
Nominal Voltage	2V	4V
Maximum charge voltage	2.35V	4.70V
Maximum charge current	0.5C Amps for continuous charge 1C Amps can be tolerated for Sporadic sessions."	
Internal Resistance	< 0.6mΩ	< 1.2mΩ
Shelf life@25°C(77°F)	2 years	
Self- Discharge	< 2% per month @ 25°C	
Design Float Life	>12 years at 27°C (80.6°F)	

Temperature	**Low**	**High**
Operation	-20°C/-4°F	50°C/122°F
storage	-30°C/-22°F	60°C/140°F

Weights & Dimensions	
Length	10.15 in/258mm
Width	6.85 in /174 mm
Height	17.2 in/427 mm
Weight	94 lbs / 42.6 kgs
Volume	1200 Cu.in/19.7 liters
Construction	
Terminal configuration	3/8 “-16 UNC
Case/Cover	PPCP
Racks	Available upon request

Discharge Rates to 1.75 VPC *					
2v 900 Ah			**4V 450 Ah**		
Hours	**Amps**	**Ah**	**Amps**	**Ah**	**Kwh**
8	93.7	750	46.9	375	1.5
10	85	850	42.5	425	1.7
20	45	900	22.5	450	1.8
24	38.3	920	19.2	460	1.84
100	9.6	960	4.8	480	1.92

Battery Life *	
DOD(%)	Cycles
30	7500-11250
50	3000-3500
65	1500-2000
80	850-1100
100	500-700
***All above are at 25°C/77°F**	

International Compliance
IEC 60896 -21/22 :2004
IEC 61427
IEC 60095
IEC 61056
IS 15549:2005
ISO 9001:2015

Charge Temperature Compensation							
Operating Temperature	°C	-20	-5	10	25	40	50
	°F	-4	23	50	77	104	131
Absorption Charge Voltage(V)	2V 900 Ah	2.55	2.45	2.40	2.35	2.30	2.25
	4V 450 Ah	5.10	4.90	4.80	4.70	4.60	4.50

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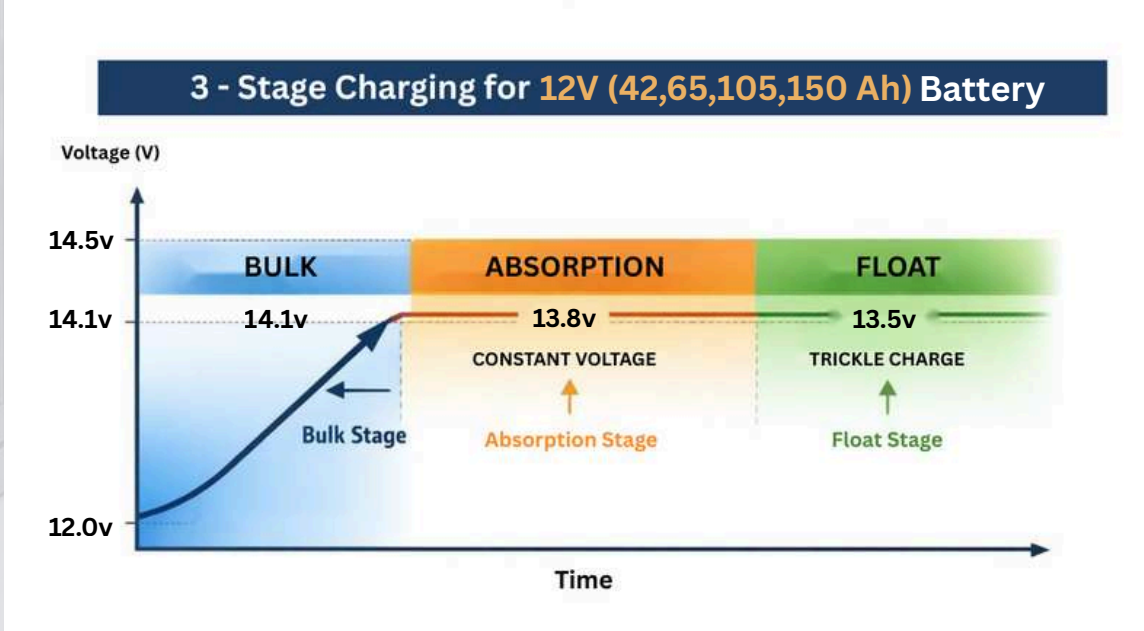
Discharge current in Amps to End volt of 1.75 V Per cell																
Battery Type	C20-Ah	No of Cells/ Bty	5 min	10 min	15 min	30 min	1 hr	2 hrs	3 hrs	4 hrs	5 hrs	6 hrs	7 hrs	8 hrs	9 hrs	10 hrs	20 hrs
12V 42 Ah	42	6	-	84.0	68.0	46.2	29.0	17.5	12.0	9.3	7.6	6.6	5.7	5.0	4.5	4.2	2.2
12V 65 Ah	65	6	-	130.0	105.2	71.4	44.8	27.1	18.6	14.4	11.8	10.2	8.8	7.7	7.0	6.4	3.3
12V 105 Ah	105	6	-	210.0	169.9	115.4	72.4	43.8	30.0	23.3	19.1	16.4	14.2	12.5	11.3	10.4	5.4
12V 150 Ah	150	6	-	300.0	242.7	164.8	103.4	62.5	42.9	33.3	27.3	23.4	20.3	17.9	16.1	14.9	7.7
4V 450 Ah	450	2	493.5	449.4	409.5	367.5	273.0	168.0	132.3	105.0	87.2	76.7	67.2	60.9	54.6	50.4	24.3
2V 900 Ah	900	1	987.0	898.8	819.0	735.0	546.0	336.0	264.6	210.0	174.3	153.3	134.4	121.8	109.2	100.8	48.5

Constant Watts Discharge/Battery to End volt of 1.75V per cell																
Battery Type	C20-Ah	No of Cells/ Bty	5 min	10 min	15 min	30 min	1 hr	2 hrs	3 hrs	4 hrs	5 hrs	6 hrs	7 hrs	8 hrs	9 hrs	10 hrs	20 hrs
12V 42 Ah	42	6	-	907	734	504	318	193	133	104	89	76	66.4	59.4	54	51	26
12V 65 Ah	65	6	-	1404	1136	780	492	299	206	161	138	118	103	92	84	79	41
12V 105 Ah	105	6	-	2268	1835	1260	795	483	333	260	222	191	166	149	135	128	66
12V 150 Ah	150	6	-	3240	2621	1800	1136	690	476	372	317	273	237	212	194	183	95
4V 450 Ah	450	2	1777	1618	1474	1338	999	618	490	391	338	297	262	241	218	207	99
2V 900 Ah	900	1	1777	1618	1474	1338	999	618	490	391	338	297	262	241	218	207	99

Constant Watts Discharge/Cell (WPC) to End volt of 1.75V per cell																
Battery Type	C20-Ah	No of Cells/ Bty	5 min	10 min	15 min	30 min	1 hr	2 hrs	3 hrs	4 hrs	5 hrs	6 hrs	7 hrs	8 hrs	9 hrs	10 hrs	20 hrs
12V 42 Ah	42	6	-	151.2	122.3	84.0	53.0	32.2	22.2	17.4	14.8	12.7	11.1	9.9	9.0	8.5	4.4
12V 65 Ah	65	6	-	234.0	189.3	130.0	82.0	49.8	34.4	26.9	22.9	19.7	17.1	15.3	14.0	13.2	6.8
12V 105 Ah	105	6	-	378.0	305.8	210.0	132.5	80.5	55.5	43.4	37.0	31.8	27.7	24.8	22.6	21.3	11.0
12V 150 Ah	150	6	-	540.0	436.9	300.0	189.3	115.0	79.3	62.0	52.9	45.5	39.5	35.4	32.3	30.4	15.8
4V 450 Ah	450	2	888.3	808.9	737.1	668.9	499.6	309.1	244.8	195.3	169.1	148.7	131.0	120.6	109.2	103.3	49.7
2V 900 Ah	900	1	1776.6	1617.8	1474.2	1337.7	999.2	618.2	489.5	390.6	338.1	297.4	262.1	241.2	218.4	206.6	99.4

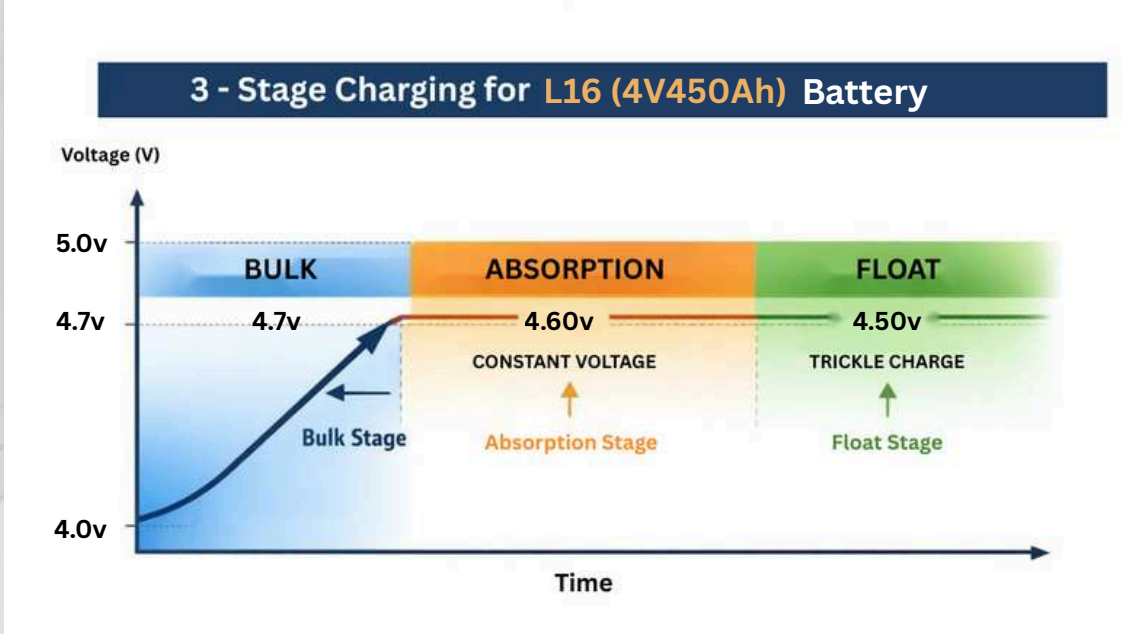
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Charging Instructions for Programmable Chargers. Battery Type : 12V (42Ah, 65Ah, 105Ah, 150Ah)											
	Bulk Phase @14.10V/battery in series					Absorption Phase @13.80V/battery in series					Float chg. Phase @13.50V/Battery
Charge rate Current Limit --->	0.1C A	0.2C A	0.3C A	0.4C A	0.5C A	0.1C A	0.2C A	0.3C A	0.4C A	0.5C A	No limit
	Charging hours to be set					Charging hours to be set					Charging hours to be set
10%	0	0	0	0	0	1	0.5	0.25	0.25	0.25	6
20%	0.5	0.5	0.5	0.25	0.25	1	0.5	0.5	0.25	0.25	6
30%	1	0.5	0.5	0.25	0.25	1	0.5	0.5	0.5	0.5	6
40%	2	1	0.5	0.25	0.25	2	0.5	0.5	0.5	0.5	6
50%	3	1.5	1	0.5	0.5	3	0.5	0.5	0.5	0.5	6
60%	4	2	1.5	1	0.5	4	1	0.5	0.5	0.5	6
70%	5	2.5	2	1.5	1	5	2	1	0.5	0.5	6
80%	6	3	2.5	2	1.5	6	3	2	0.5	0.5	6



NOTE:
For Initial Charging before commissioing / cycling / Recovery Charging after every 15/ 30 cycles)
CCCV (Constant Current_ Constant Voltage) Chargers with in built Temperature Compensation
Temperature Sensor shall be fixed to Battery Terminals only.
All the chargers to be used shall be with Automatic Temperature compensation type with sensors
Chargers without Temperature compensation shall not be used. If used , warranty will be void.

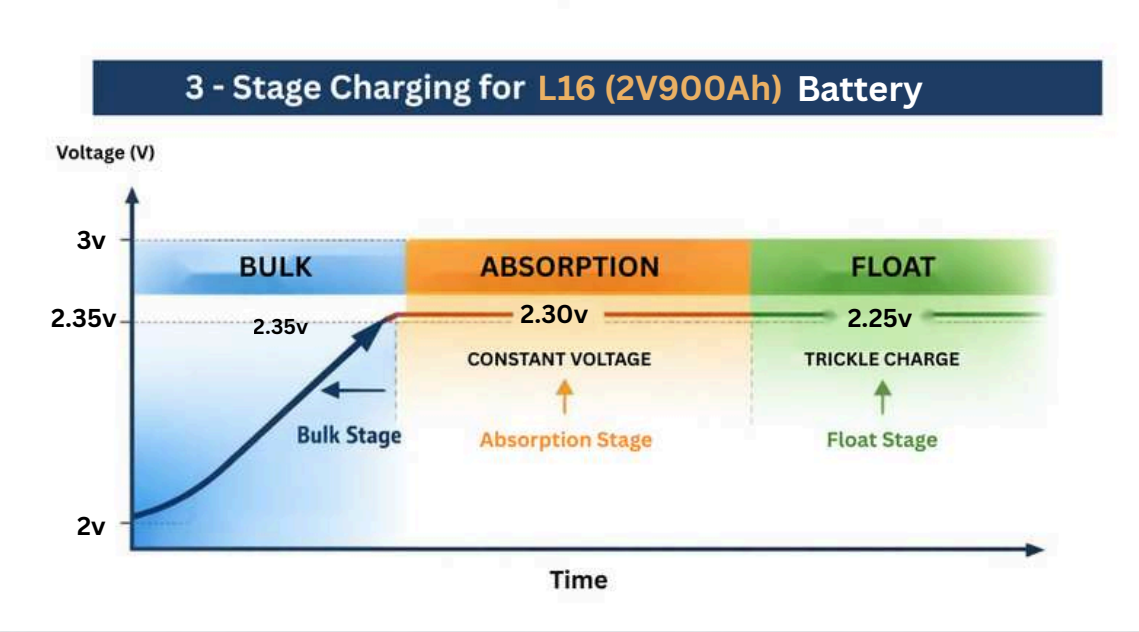
Charging Instructions for Programmable Chargers. Battery Type : L-16 (4V450Ah)											
	Bulk Phase @4.70V/battery in series					Absorption Phase @4.60V/battery in series					Float chg. Phase @4.50V/Battery
Charge rate Current Limit ------>	0.1C A	0.2C A	0.3C A	0.4C A	0.5C A	0.1C A	0.2C A	0.3C A	0.4C A	0.5C A	No limit
	Charging hours to be set					Charging hours to be set					Charging hours to be set
10%	0	0	0	0	0	1	0.5	0.25	0.25	0.25	6
20%	0.5	0.5	0.5	0.25	0.25	1	0.5	0.5	0.25	0.25	6
30%	1	0.5	0.5	0.25	0.25	1	0.5	0.5	0.5	0.5	6
40%	2	1	0.5	0.25	0.25	2	0.5	0.5	0.5	0.5	6
50%	3	1.5	1	0.5	0.5	3	0.5	0.5	0.5	0.5	6
60%	4	2	1.5	1	0.5	4	1	0.5	0.5	0.5	6
70%	5	2.5	2	1.5	1	5	2	1	0.5	0.5	6
80%	6	3	2.5	2	1.5	6	3	2	0.5	0.5	6



NOTE:
For Initial Charging before commissioing / cycling / Recovery Charging after every 15/ 30 cycles)
CCCV (Constant Current_ Constant Voltage) Chargers with in built Temperature Compensation
Temperature Sensor shall be fixed to Battery Terminals only.
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Charging Instructions for Programmable Chargers. Battery Type : L-16 (2V900Ah)											
	Bulk Phase @2.35V/battery in series					Absorption Phase @2.30V/battery in series					Float chg. Phase @2.25V/Battery
Charge rate Current Limit ----->	0.1C A	0.2C A	0.3C A	0.4C A	0.5C A	0.1C A	0.2C A	0.3C A	0.4C A	0.5C A	No limit
	Charging hours to be set					Charging hours to be set					Charging hours to be set
10%	0	0	0	0	0	1	0.5	0.25	0.25	0.25	6
20%	0.5	0.5	0.5	0.25	0.25	1	0.5	0.5	0.25	0.25	6
30%	1	0.5	0.5	0.25	0.25	1	0.5	0.5	0.5	0.5	6
40%	2	1	0.5	0.25	0.25	2	0.5	0.5	0.5	0.5	6
50%	3	1.5	1	0.5	0.5	3	0.5	0.5	0.5	0.5	6
60%	4	2	1.5	1	0.5	4	1	0.5	0.5	0.5	6
70%	5	2.5	2	1.5	1	5	2	1	0.5	0.5	6
80%	6	3	2.5	2	1.5	6	3	2	0.5	0.5	6



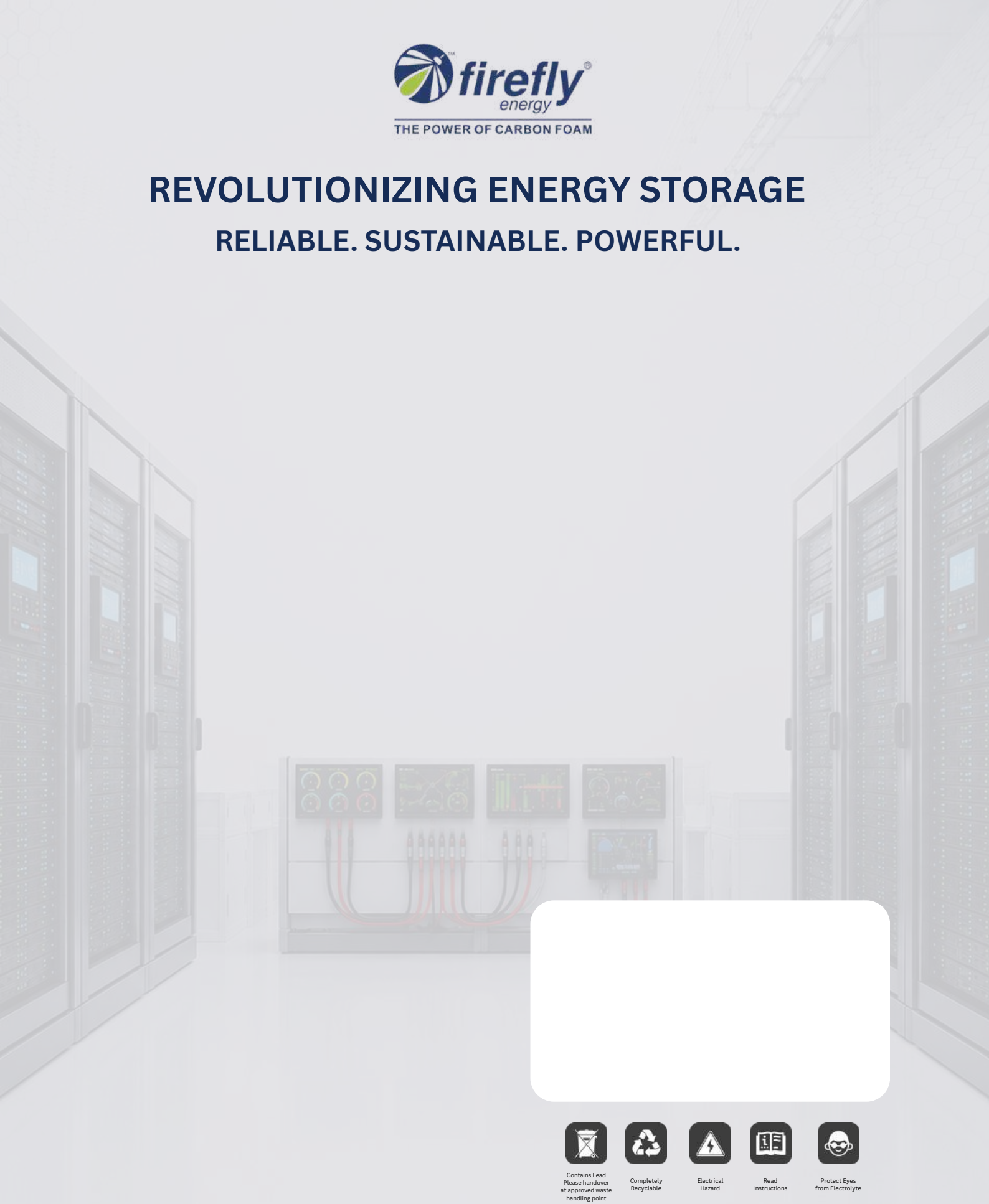
NOTE:
For Initial Charging before commissioing / cycling / Recovery Charging after every 15/ 30 cycles)
CCCV (Constant Current_ Constant Voltage) Chargers with in built Temperature Compensation
Temperature Sensor shall be fixed to Battery Terminals only.
All the chargers to be used shall be with Automatic Temperature compensation type with sensors
Chargers without Temperature compensation shall not be used. If used , warranty will be void.

firefly energy

THE POWER OF CARBON FOAM

REVOLUTIONIZING ENERGY STORAGE

RELIABLE. SUSTAINABLE. POWERFUL.



Contains Lead Please handover at approved waste handling point

Completely Recyclable

Electrical Hazard

Read Instructions

Protect Eyes from Electrolyte

www.fireflyenergy.com

info@fireflyenergy.com