

Battery Range Summary



Features and Benefits

- **Capacity range: 31Ah - 190Ah**
- **Front terminal connections for fast and easy installation and maintenance**
- **Suitable for 19", 23" and ETSI racking**
- **UL94 V-0 flame retardant containers and lids**
- **High energy density**
- **Fast charge acceptance capability**
- **High reliability**
- **Long design life (12+ years at 20°C)**

The PowerSafe® V Front Terminal range of valve regulated lead acid batteries has been designed specifically for use in applications that demand the highest levels of security and reliability. With compliance to the most rigorous international standards, PowerSafe V-FT batteries are recognised worldwide as a premium solution for Telecom applications. The reputation of PowerSafe V-FT batteries for long service life, together with excellent high rate performance, also makes it ideal for high integrity, high specification UPS systems.

PowerSafe V-FT batteries deliver superior performance while occupying less space than conventional standby power batteries. A range of compact designs, suitable for 19", 23" and ETSI racking, provides users with the benefit of increased energy density. With all electrical connections at the front, installation and inspection are both quicker and easier.

PowerSafe V-FT batteries benefit from EnerSys' state-of-the-art Thin Plate Pure Lead manufacturing platform. Monoblocs are designed using gas recombination technology which removes the need for regular water addition by controlling the evolution of hydrogen and oxygen during charging. Oxygen evolved at the positive plates diffuses through microporous separators to the negative plates, and, by a series of chemical reactions within the cell, recombines to form water. Each cell incorporates its own safety valve that allows the controlled release of gas when pressure builds up within the cell.

Construction

- Pure lead grid design to prolong service life and enhance corrosion resistance
- Separators in low resistance microporous glass fibre. The electrolyte is absorbed within this material, preventing acid spills in case of accidental damage
- Containers and lids in flame retardant ABS material, highly resistant to shocks and vibrations
- Terminal with brass insert for maximum conductivity and with high compression grommet for long life
- Self-regulating pressure relief valve prevents ingress of atmospheric oxygen
- Flame arrestors built into each bloc for increased operational safety

Installation & Operation

- Designed for operation in reliable grid, grid assist and unreliable grid (low risk of partial state of charge)
- Monoblocs are designed for installation in cabinets or on stands, close to the point of use. A separate battery room is not necessary
- It is recommended that PowerSafe® V Front Terminal batteries are installed on their base. Please consult your EnerSys representative about any other installation orientation
- Recommended float charge voltage: 2.29Vpc at 20°C
2.27Vpc at 25°C
- 24 months shelf life at 20°C
- Reduced maintenance: no water addition required
- Wide operating temperature range: -30°C to +45°C

Standards

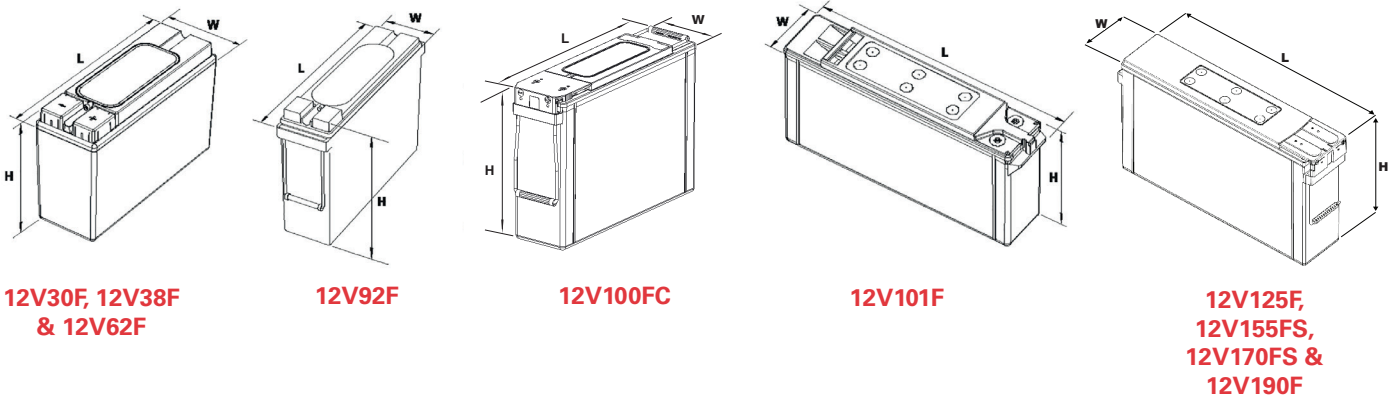
- Designed to be compliant with IEC 60896-21/22
- Classified as "Very Long Life" (> 12 years) according to the Eurobat Guide 2015
- UL recognised component
- Batteries must be installed in accordance with IEC 62485-2 and local/national regulations
- Classified as non-spillable battery and approved as non-hazardous cargo for land, sea and air transportation in accordance with the requirements of ADR / RID, IMDG and IATA respectively
- The management systems governing the manufacture of PowerSafe V-FT products are ISO 9001, ISO 14001 and ISO 45001 certified

General Specifications

Battery Type	Nominal Voltage (V)	Nominal Capacity (Ah)		Nominal Dimensions (mm)			Typical Weight (Kg)	Short Circuit Current (A) ⁽²⁾	Internal Resistance (mΩ) ⁽²⁾	Terminals
		10 hr rate to 1.80Vpc @ 20°C	8 hr rate to 1.75Vpc @ 77°F	Length	Width	Overall Height				
12V30F ⁽³⁾	12	31	31	280	97	159	10.8	1327	9.87	M8 F
12V38F ⁽³⁾	12	38	38	280	97	184	11.8	1415	8.88	M8 F
12V62F ⁽³⁾	12	62	62	280	97	264	19.2	2080	5.98	M8 F
12V92F ^{(1) (3)}	12	92	92	395	105	264	27.6	2410	5.19	M8 F
12V100FC ^{(1) (3)}	12	100	100	395	108	288	31.0	1930	6.46	M8 F
12V101F ^{(1) (4)}	12	100	101	510	110	235	32.2	2351	5.35	M8 F
12V125F ^{(1) (4)}	12	125	126	561	105	316	44.5	2355	5.30	M6 M
12V155FS ^{(1) (4)}	12	150	155	561	125	283	48.5	3325	3.80	M6 M
12V170FS ^{(1) (4)}	12	170	170	561	125	283	50.8	3360	3.75	M6 M
12V190F ^{(1) (4)}	12	190	190	561	125	316	57.3	3625	3.50	M6 M

Notes: ⁽¹⁾ With built-in or rope handles ⁽²⁾ Figures obtained via IEC method ⁽³⁾ With built-in manifold ⁽⁴⁾ Manifold available as an option (increases product height by 12mm)

Outline Drawings



EnerSys World Headquarters
2366 Bernville Road, Reading,
PA 19605, USA
Tel: +1-610-208-1991 /
+1-800-538-3627

EnerSys EMEA
EH Europe GmbH,
Baarerstrasse 18,
6300 Zug
Switzerland

EnerSys Asia
152 Beach Road,
Gateway East Building #11-08,
Singapore 189721
Tel: +65 6416 4800

Contact:

EnerSys®

Power/Full Solutions



PowerSafe®
FRONT TERMINAL

Performance Data

Constant Current Discharge Performance Data

Discharge Currents (Amperes) to 1.75Vpc at 77°F (25°C)

Battery Type	Standby Stime (Minutes)			Standby Stime (Hours)										
	15	30	45	1	2	3	4	5	6	7	8	10	12	24
12V30F	65.45	39.22	28.56	22.71	12.77	9.015	7.044	5.829	4.989	4.372	3.896	3.21	2.741	1.499
12V38F	79.7	47.49	34.29	27.06	15.1	10.64	8.341	6.916	5.943	5.235	4.694	3.914	3.372	1.884
12V62F-FT	122.8	76.13	56.39	45.14	25.7	18.25	14.26	11.77	10.07	8.808	7.824	6.389	5.429	2.939
12V92F-FT	161	106.7	80.25	64.71	37.09	26.43	20.63	17.01	14.56	12.78	11.43	9.49	8.158	4.515
12V100F	169.3	110.8	83.34	67.27	39.37	28.44	22.48	18.68	16.05	14.1	12.59	10.39	8.82	4.787
12V100FC	175.8	118.1	90.09	73.48	43.23	30.97	24.18	19.86	16.85	14.62	12.94	10.59	9.048	4.777
12V101F	160.1	107.8	83.11	67.68	39.74	28.62	22.59	18.76	16.11	14.21	12.72	10.52	8.789	4.423
12V125F	189.1	137.3	105	85.06	50.03	35.83	28.29	23.54	20.12	17.58	15.63	12.88	10.73	5.481
12V155FS	253.1	174.1	133.5	108.8	62.9	45.02	35.34	29.24	25.01	21.9	19.49	16.01	13.56	7.234
12V170FS	287.5	203.9	153.8	124.1	71.82	51.13	39.9	32.81	27.91	24.33	21.57	17.66	15.04	8.107
12V190F	299.3	212.6	165.5	136.3	80.03	57.17	44.71	36.79	31.28	27.24	24.19	19.84	16.91	9.082

Discharge Currents (Amperes) to 1.80Vpc at 77°F (25°C)

Battery Type	Standby Stime (Minutes)			Standby Stime (Hours)										
	15	30	45	1	2	3	4	5	6	7	8	10	12	24
12V30F	63.3	37.89	27.67	22.07	12.5	8.861	6.94	5.747	4.921	4.313	3.845	3.168	2.706	1.481
12V38F	77.32	46.76	33.92	26.81	14.95	10.55	8.305	6.89	5.921	5.216	4.677	3.9	3.36	1.877
12V62F-FT	115.4	72.74	54.3	43.69	25.13	17.96	14.1	11.66	9.995	8.763	7.787	6.362	5.404	2.933
12V92F-FT	147.4	100.7	77.11	62.76	36.52	26.18	20.48	16.9	14.45	12.68	11.34	9.421	8.119	4.5
12V100F	158.7	106.7	81.06	65.62	38.56	27.88	22.05	18.33	15.75	13.83	12.35	10.19	8.67	4.762
12V100FC	160.8	110.3	85.17	70.02	41.81	30.16	23.65	19.48	16.55	14.37	12.73	10.45	8.935	4.736
12V101F	150	103.2	79.91	65.2	38.45	27.78	21.98	18.33	15.78	13.91	12.43	10.29	8.558	4.406
12V125F	171.4	127.7	98.49	79.53	47.86	34.47	27.43	22.93	19.68	17.21	15.4	12.78	10.68	5.481
12V155FS	237	165.9	127.9	104.9	60.72	43.52	34.18	28.28	24.2	21.19	18.86	15.48	13.12	7.026
12V170FS	267.5	194.2	148.1	120.1	70.15	50.14	39.16	32.24	27.45	23.93	21.23	17.4	14.83	7.985
12V190F	278.3	203.9	160	132.1	78.11	56.07	43.87	36.14	30.74	26.77	23.77	19.5	16.62	8.931

Discharge Currents (Amperes) to 1.85Vpc at 77°F (25°C)

Battery Type	Standby Stime (Minutes)			Standby Stime (Hours)										
	15	30	45	1	2	3	4	5	6	7	8	10	12	24
12V30F	60.25	36.23	26.46	21.13	12.11	8.612	6.797	5.634	4.83	4.24	3.788	3.132	2.675	1.462
12V38F	73.91	45.6	33.29	26.22	14.58	10.28	8.052	6.682	5.746	5.065	4.543	3.789	3.265	1.831
12V62F-FT	106.5	68.17	51.37	41.54	24.26	17.44	13.79	11.46	9.808	8.611	7.678	6.336	5.377	2.91
12V92F-FT	132	92.86	72.7	60.04	35.49	25.8	20.17	16.79	14.35	12.59	11.25	9.34	8.021	4.485
12V100F	144.4	98.83	76.32	61.86	36.8	26.62	21.04	17.5	15.04	13.22	11.83	9.829	8.38	4.653
12V100FC	145.2	101.5	79	65.18	39.57	28.89	22.71	18.75	15.99	13.9	12.31	10.15	8.683	4.658
12V101F	136	95.42	74.48	60.86	36.13	26.08	20.73	17.32	14.92	13.14	11.75	9.769	8.114	4.329
12V125F	151.3	112.5	86.87	70.55	43.16	31.25	25.06	20.98	18.06	15.85	14.18	11.88	9.855	5.463
12V155FS	215.3	153.5	119	98.27	57.17	40.88	32.09	26.56	22.73	19.9	17.73	14.57	12.35	6.642
12V170FS	243.1	179.7	138.9	113.4	66.98	48.02	37.66	30.97	26.34	22.95	20.35	16.68	14.22	7.702
12V190F	259.4	193	151.8	125.2	74.57	53.77	42.24	34.76	29.55	25.75	22.86	18.78	16.03	8.691

Constant Current Discharge Performance Data

Discharge Currents (Amperes) to 1.90Vpc at 77°F (25°C)

Battery Type	Standby Stime (Minutes)			Standby Stime (Hours)										
	15	30	45	1	2	3	4	5	6	7	8	10	12	24
12V30F	52.45	31.33	22.98	18.37	10.48	7.486	5.894	4.887	4.188	3.67	3.272	2.702	2.311	1.294
12V38F	65.88	39.98	28.89	22.7	12.55	8.873	6.967	5.789	4.985	4.397	3.944	3.287	2.828	1.607
12V62F-FT	93.49	60.03	45.14	36.49	21.27	15.32	12.09	10.05	8.625	7.548	6.699	5.493	4.678	2.593
12V92F-FT	116.4	82.37	64.03	52.26	30.93	22.2	17.4	14.4	12.36	10.88	9.746	8.104	6.961	3.928
12V100F	121.4	81.92	62.06	50.54	29.53	21.32	16.86	13.98	12.05	10.63	9.485	7.822	6.699	3.829
12V100FC	129.6	89.88	70.03	57.95	35.06	25.41	19.98	16.44	13.96	12.15	10.82	8.962	7.662	4.063
12V101F	115.5	80.08	61.19	49.61	29.06	21.1	16.75	13.99	12.01	10.67	9.495	7.639	6.463	3.571
12V125F	130.9	93	70.06	58.48	34.8	25.65	20.43	17.07	14.71	13.08	11.73	9.417	7.948	4.641
12V155FS	194	136.7	105.9	85.55	49.42	35.35	27.75	22.96	19.63	17.18	15.27	12.49	10.59	5.797
12V170FS	209.6	148.2	112.8	91.71	53.6	38.14	29.7	24.37	20.69	18.01	16.03	13.22	11.29	6.254
12V190F	234.3	169.2	131.2	107.4	63.33	45.36	35.43	29.07	24.71	21.54	19.17	15.82	13.5	7.469

Visit us at www.enersys.com



EnerSys World Headquarters
2366 Bernville Road, Reading,
PA 19605, USA
Tel: +1-610-208-1991 /
+1-800-538-3627

EnerSys EMEA
EH Europe GmbH,
Baarerstrasse 18,
6300 Zug
Switzerland

EnerSys Asia
152 Beach Road,
Gateway East Building #11-08,
Singapore 189721
Tel: +65 6416 4800

Contact:



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Application Guide

The PowerSafe® V front terminal series benefits from EnerSys® renowned Thin Plate Pure Lead (TPPL) manufacturing platform to deliver energy storage solutions that meet the requirements of emerging applications whilst offering end users enhanced performance in traditional float applications.

PowerSafe V front terminal blocs retain long float characteristics with the added benefit of improved cyclability in grid assist and selected unreliable grid applications.

Applications

Table 1 below outlines the suitability of PowerSafe® V front terminal blocs for various types of reserve power applications.

Application	Demands on Battery	Application Suitability
Reliable grid	- Stable grid - Controlled ambient temperature - Compensated float voltage - Very little cyclic use	Yes
Grid assist	- Regions where grid is supported with scheduled outages - Reasonable temperature control - Compensated float voltage - Medium level cyclic use	Yes
Unreliable grid (Low risk of PSoC)*	- Poor grid stability - Frequent power outages / scheduled & unscheduled - Poor temperature control - High cyclic use - Cycles can be shallow / deep - Low risk for uncontrolled partial state of charge	Yes
Unreliable grid (high risk of PSoC)*	- Poor grid stability - Frequent power outages / scheduled & unscheduled - Poor temperature control - High cyclic use - Cycles can be shallow / deep - High risk for uncontrolled partial state of charge	No

TABLE 1

Table 2 provides a summary of the operating charging parameters that will deliver optimum service life and performance relative to the type of application.

Application	Charge Parameter for Optimised Life and Performance
Reliable grid	✓ Temperature compensated float voltage equivalent to 2.29Vpc @ 20°C ✓ Charge current - minimum 0.1C₁₀A, maximum unlimited, typically 0.5C₁₀A
Grid assist	✓ Boost voltage equivalent to 2.40Vpc @ 20°C to fast charge ✓ Charge current – minimum 0.1C₁₀A. Maximum unlimited, typically 0.5C₁₀A ✓ Followed by float voltage with temperature compensation applied as required
Unreliable grid (Low risk of PSoC)*	✓ Boost voltage equivalent to 2.40Vpc @ 20°C to fast charge ✓ Charge current – minimum 0.1C₁₀A. Maximum unlimited, typically 0.5C₁₀A ✓ Followed by float voltage with temperature compensation applied as required

TABLE 2

*Partial state of charge

Operating Temperature Range

The recommended operating temperature for optimum life and performance is 20°C. However, PowerSafe V front terminal blocs can be operated in the temperature range of -30°C to +45°C.

Storage

All lead acid batteries lose capacity when standing on open-circuit because of parasitic chemical reactions. The purity of the component materials used in the construction of PowerSafe V front terminal blocs results in a very low rate of self-discharge delivering up to 2 years shelf life at 20°C before a refresh charge is required.

Batteries should be stored in a cool and dry area. Please note that high temperature increases the rate of self-discharge and reduces storage life. The maximum storage times before a refresh charge is required and recommended open circuit voltage audit intervals are illustrated in **table 3**.

Temperature (°C / °F)	Storage Time (Months)	OCV Audit Interval (Months)
+10 / +50	48	12
+20 / +68	24	12
+30 / +86	12	6
+40 / +104	6	3

TABLE 3

PowerSafe V front terminal blocs must be given a refresh charge when the OCV approaches the equivalent of 2.10 Volts per cell or when the maximum storage time is reached, whichever occurs first.

Refresh Charge

A refresh charge should be performed at a constant voltage equivalent to 2.40Vpc with minimum 0.1C₁₀ Amps current for a period of 24 hours.

Commissioning Charge

Before conducting a capacity discharge or commencing cycling, the battery must be given a commissioning charge. In float applications the commissioning charge shall consist of 96 hours of float charge at the recommended float voltage (2.29Vpc at 20°C) with no load connected to the battery. Alternatively the commissioning charge may consist of 24 hours charge at a voltage equivalent to 2.40Vpc at 20°C with minimum 0.1C₁₀ A charge current, with no load connected.

Float Operation

The PowerSafe V front terminal series is designed for continuous float operation on constant voltage chargers. Constant voltage charging is the safest, most efficient and recommended method of charging VRLA batteries.

The recommended float voltage setting is 2.29Vpc at +20°C. Therefore the system voltage setting equals the number of cells in series x 2.29Vpc.

Battery life and charging characteristics are affected by temperature. The optimum battery life will be achieved when the battery is operated at +20°C (see **figure 1**).

Capacity Fade During Life - Float Application

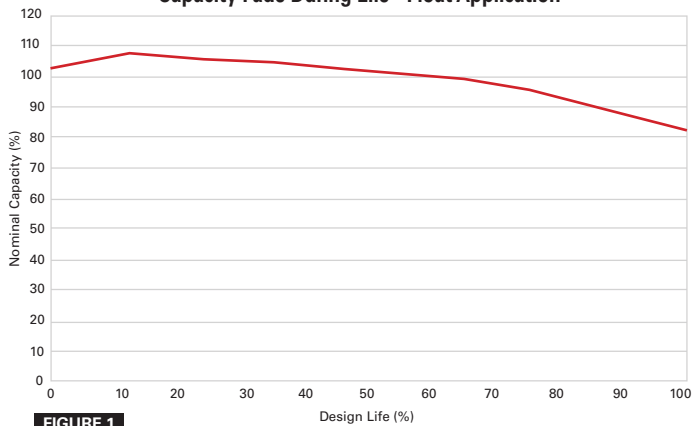


FIGURE 1

Battery life is reduced by 50% for every 10°C/18°F increase in temperature (see figure 2). Float voltage compensation reduces the charging current as battery temperature increases and partially negates the adverse effect of high temperature.

**Design Life as a Function of Temperature
(Continuous Float Operation - Uncompensated Float Voltage)**

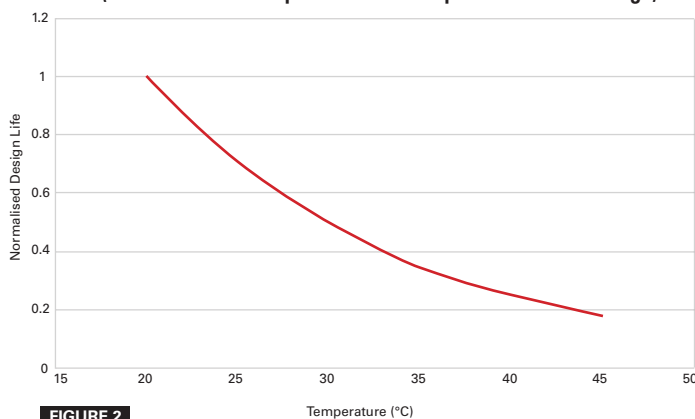


FIGURE 2

The recommended float voltage temperature compensation is:

- 2.29Vpc +4mV per cell per °C below 20°C
 - 2.29Vpc -4mV per cell per °C above 20°C
- (refer to figure 3 for further details)

Temperature compensation is capped at +40°C/+104°F as at this temperature the compensated charge voltage approaches the natural open circuit voltage of the battery and there is insufficient overvoltage to keep the battery in a fully charged condition.

Float Voltage Temperature Compensation

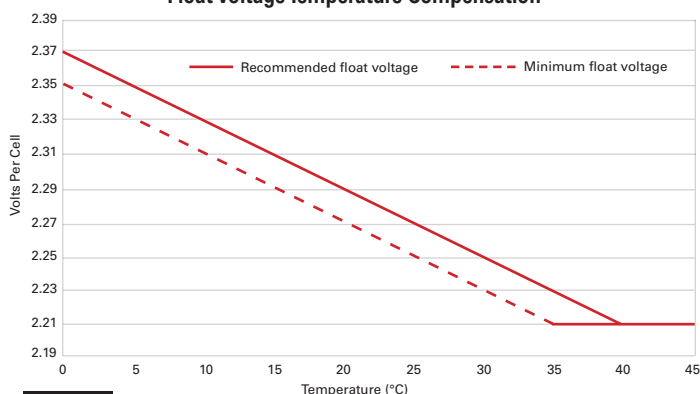


FIGURE 3

Due to the very low internal resistance, PowerSafe V-FT monoblocs will accept unlimited current during recharge, although typically 0.5C₁₀ A is used as a maximum.

Figure 4 illustrates the typical time to full state of charge when recharged with temperature compensated float voltage as a function of available charge current from varying depths of discharge.

Recharge Time as a Function of Depth of Discharge and Charge Rate at Float Voltage

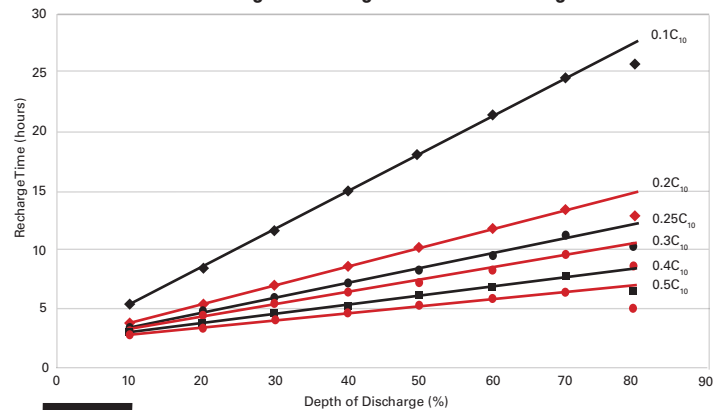


FIGURE 4

Fast Charging Operation

The inherently high charge acceptance of the core TPPL technology used in the PowerSafe® V front terminal series is suited for applications which require a fast time to repeat duty. In such applications the rectifier voltage should be set at 2.40Vpc at 20°C.

As with float charge, temperature compensation for voltage is applicable to fast charge techniques. The profile below (figure 5) gives the recommended compensation to charge voltage for temperature.

Fast Charge Temperature Compensation

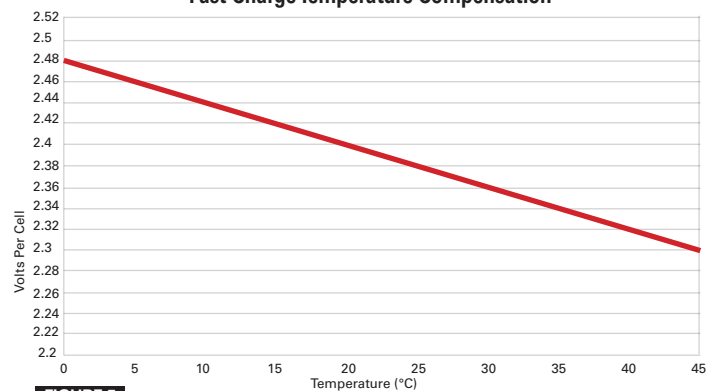


FIGURE 5

Once fully charged the voltage can be changed to float voltage with temperature compensation as required.

Fast Charging Current Limit

In addition to the influence of charge voltage, the available charge current will impact on time to repeat duty. **Figure 6** illustrates the typical time to full state of charge (2.40Vpc) as a function of available charge current from varying depths of discharge.

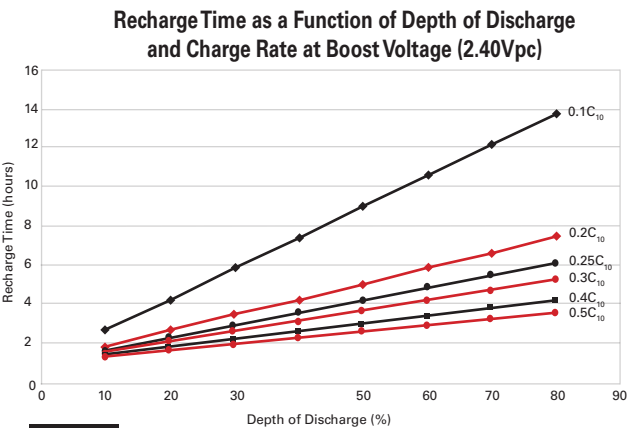


FIGURE 6

Grid Assist & Selected Unreliable Grid Cycling

The PowerSafe® V front terminal series has the added capability to deliver high cyclic performance in grid assist and unreliable grid applications where there is a low risk of partial state of charge operation.

Figure 7 indicates the cyclic capability in a typical unreliable grid application. Please note that the obtained life is dependent on site conditions.

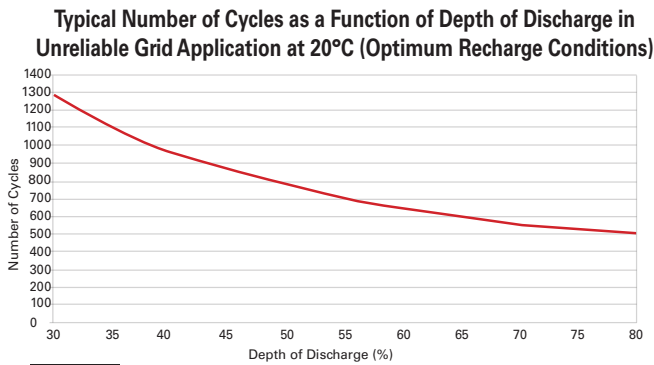


FIGURE 7



EnerSys World Headquarters
2366 Bernville Road, Reading,
PA 19605, USA
Tel: +1-610-208-1991 /
+1-800-538-3627

EnerSys EMEA
EH Europe GmbH
Baarerstrasse 18,
6300 Zug
Switzerland

EnerSys Asia
152 Beach Road,
Gateway East Building #11-08,
Singapore 189721
Tel: +65 6416 4800

Contact: