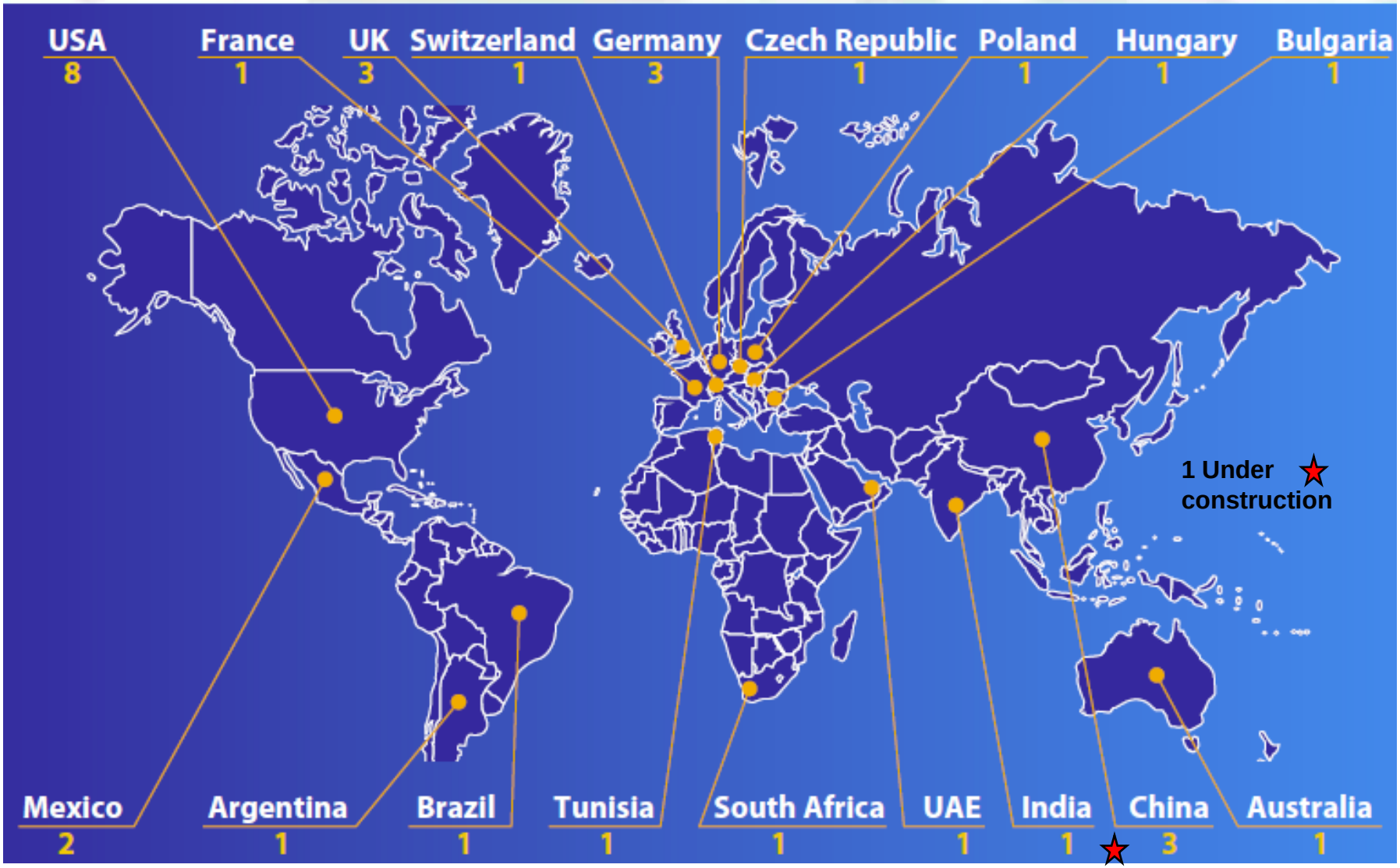
PowerSafe® SBS EON® TECHNOLOGY

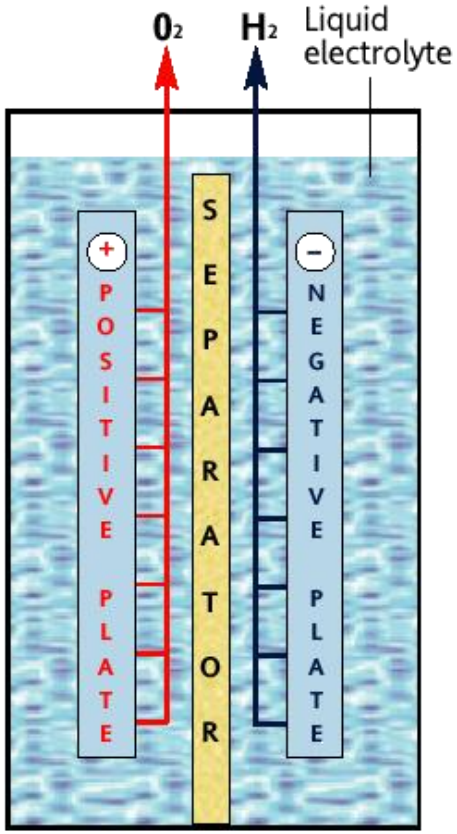
EnerSys® Power/Full Solutions

Enersys Battery Solutions

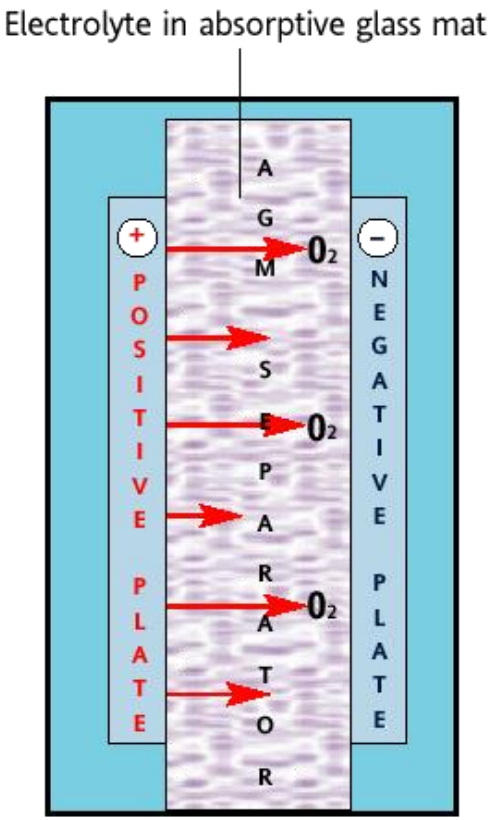
32 x Global Manufacturing Locations &
9,000 Thousands Employee's



Battery Technologies



Flooded



VRLA AGM

VRLA Gel

Vs.

PowerSafe™ SBS

Traditional Lead-Calcium AGM Monobloc Product

THIN PLATE THE ADVANTAGE

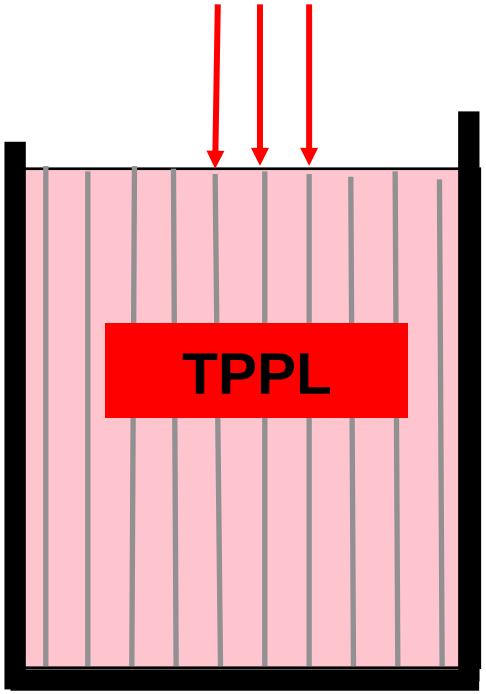
ENERSYS MANUFACTURING PROCESS ALLOWS PROCESSING OF PURE LEAD GRID RESULT : 1mm THIN

CONVENTIONAL BATTERY BOOKMOLD CASTING REQUIRES ARTIFICIAL HARDENERS TO PROCESS GRID

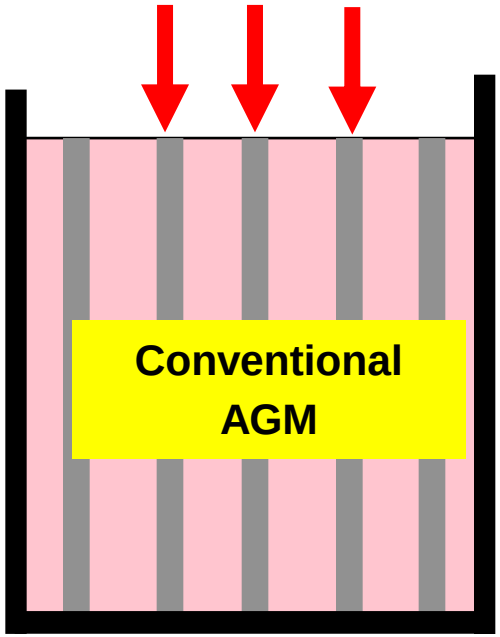
RESULT : 2 - 4 mm THICK

SBS Eon THIN PLATE TECHNOLOGY = MORE PLATES IN EACH 2 VOLT CELL

RESULT = MORE CRANKING AMPS & SUPERIOR POWER & ENERGY DENSITY



100ahr 32.6KG



100ahr 30.8KG
(V series)

What Makes PowerSafe SBS Different?

EnerSys Power/Full Solutions

- Extremely Thin Grids → High Power Density
- Highly-Automated Process → Product Consistency
- 99.99% Pure-Lead
  - Grid Corrosion & Growth no Longer Limiter for Battery Life

→
  - Longer Float Life
  - Higher Cycling Capabilities
  - Better Recovery From Abuse
  - Long Shelf Life
- Medical-Grade Acid

	PowerSafe™ SBS	Traditional AGM
Cost / Ah	1.20X	X
Energy Density (Ah / ft^3 @ 12V)	244.5	218.7
Ah/lb	1.44	1.15
Approximate Design Life @ 25ºC	15 years	5 to 10 years
Shelf Life @ 77ºF	24 months	6 months
Pos Grid Thickness	0.040”	0.111”
Grid Composition	99.9% Pure Lead	Lead-Calcium-Tin Alloy
Float Current (**mAmp**s / 100Ah)	20	30 to 100
Cycle Life @ 80% DoD	375 / 620 Float / Boost (Hybrid)	220

	PowerSafe™ SBS	Traditional AGM
Cost		✓
Energy Density	✓	
Ah/lb	✓	
Approximate Design Life	✓	
Shelf Life @ 77ºF	✓	
Grid Composition	✓	
Float Current	✓	
Cycle Life	✓	

PowerSafe™ SBS

EnerSys® Power/Full Solutions

Tubular Gel

Cost / Ah	X	2 to 3x
Energy Density (Ah / ft^3 @ 12V)	244.5	118.6
Ah/lb	1.44	0.84
Approximate Design Life @ 25ºC	15 years	20 years
Nonspillable?	Yes	Sometimes
Pos Grid (Rod) Thickness	0.040”	0.126”
Grid Composition	99.9% Pure Lead	Lead-Calcium-Tin Alloy
Float Current (mAmps / 100Ah)	20	7 to 26
Cycle Life @ 80% DoD	375 / 620 Float / Boost (Hybrid)	850

PowerSafe™ SBS

Tubular Gel

Cost	✓	
Energy Density	✓	
Ah/lb	✓	
Approximate Design Life		✓
Shelf Life @ 77ºF	✓	
Grid Composition	✓	
Float Current	✓	
Cycle Life		✓

Summary of Telecom applications

EnerSys®
Power/Full Solutions

PowerSafe®

genesis® TD

1) Float charge mode: Stable grid, stable ambient temperature, temp compensated float charge current, no cyclic use (<10 cycles p.a.)	2) Grid assist application: Quite stable grid, ambient temp. more/less stable, medium cyclic use (50-100 cycles p.a.), low risk for PSOC
3) PSOC: Unstable grid, warm ambient, uncontrolled cyclic use (incl. microcycles), high risk for PSOC	4) Off Grid Mode: Diesel-hybrid, warm ambient regular cyclic use ➔ usually 1 cycle per day

PowerSafe™ SBS

PSOC: Partial State Of Charge

PowerSafe®

EnerSys Technology matrix

Characteristic	PowerSafe V FT	OPzV	SBS Eon
nominal voltage	12V	2V	2 - 12V
Nominal capacity	30 - 190Ah	215 to 3170Ah	62 to 410Ah
Shelf life	6 months	6 months	2 years
Design life	12 years	20 years	15 years
IEC Float cycles (40% DOD)	450	1900	650
Hybrid cycls (60% dod) 35Deg C 100% SOC / **PSOC** (85%) per cycle	no	1203 / **902**	1170 / **878**
Hybrid cycls (60% dod) @50Deg C 100% SOC / **PSOC** (85%) per cycle	n/a	n/a	1170 / **878**
Cycles derating for temperature	yes	yes	no

Applications selection matrix:

Application	SBS EON	PowerSafe V FT	OPzV
Stable grid (float)	✓	✓	✓
Grid assist – daily cycle	✓	✗	✓
Unreliable grid – uncontrolled PSOC	✓	✗	✓
Hybrid – Full SOC	✓	✗	✓
Hybrid – Controlled PSOC	✓	✗	✗/✓

HYBRIDS – OPzV

- OPzV: Controlled partial state of charge hybrid cycling

OPzV: Controlled partial state of charge hybrid cycling

Specification:

* Charging @ 2.40 Vpc until 90% of the state of charge is achieved
* Charging @ 2.40 Vpc until full state of charge is achieved once per week
* Minimum charging current 10% of C10. Max is recommended to be 40% of C10
* Operation according technical/maintenance manual and Operation Guide for Hybrid Applications

No. of CYCLES	% Depth Discharge							
Temperature °C	10	20	30	40	50	60	70	80
20	8743	4101	2634	1924	1508	1236	1044	902
25	8568	4019	2581	1885	1477	1211	1023	884
30	7431	3486	2239	1635	1281	1051	887	767
35	6382	2994	1923	1404	1100	902	762	659

HYBRIDS – SBS EON TPPL

- SBS Eon: Controlled partial state of charge hybrid cycling

Specification:

* Charging @ 2.40 Vpc until 90% of the state of charge is achieved

* Charging @ 2.40 Vpc until full state of charge is achieved once per week

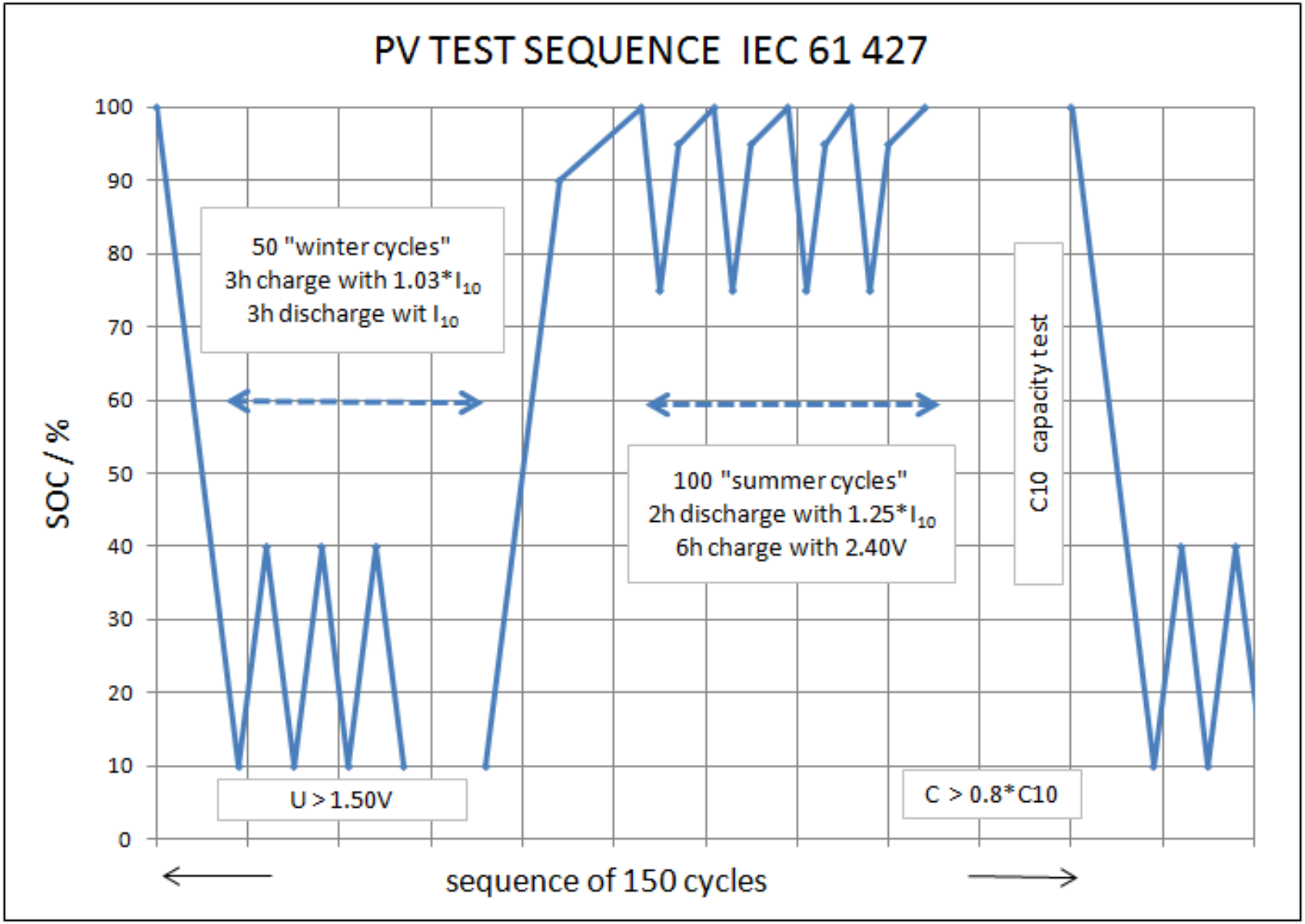
- Minimum charging current 10% of C10. Max is recommended to be 100% of C10
- - (E.g. In SBS 170 = 170A)

* Operation according technical/maintenance manual and Operation Guide for Hybrid Applications

No. of CYCLES	% Depth Discharge							
Temperature °C	10	20	30	40	50	60	70	80
20	3450	2456	1875	1463	1140	878	656	465
25	3450	2456	1875	1463	1140	878	656	465
30	3450	2456	1875	1463	1140	878	656	465
35	3450	2456	1875	1463	1140	878	656	465
40	3450	2456	1875	1463	1140	878	656	465
45	3450	2456	1875	1463	1140	878	656	465
50	3450	2456	1875	1463	1140	878	656	465

Table 2. Cycles as a function of % dod and temperature in psoc hybrid applications

IEC 61427 - PSOC

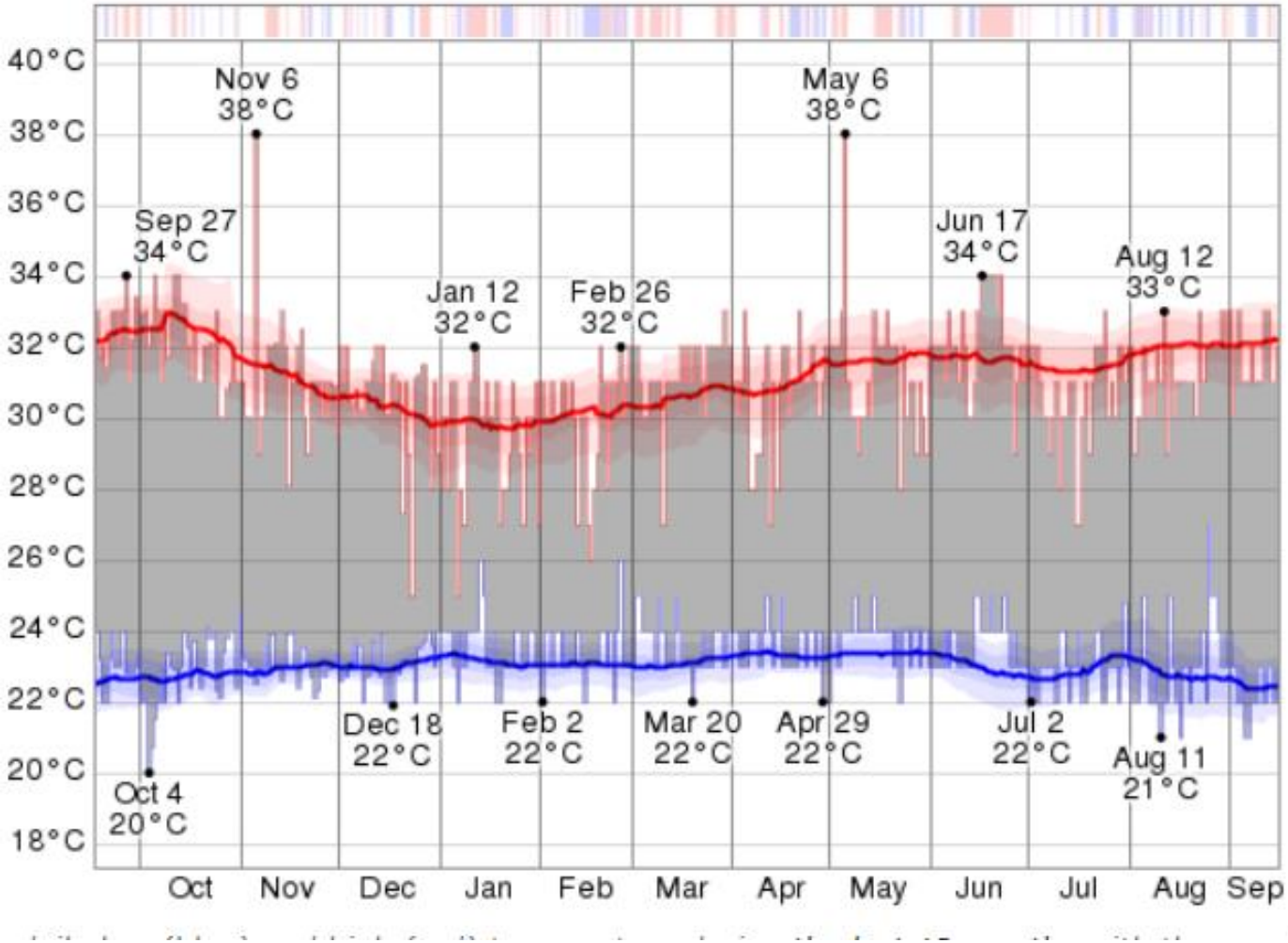


AMBIENT Temperature Statistics - ASIA

NOTE:

AMBIENT AVG = 28'C – 27' C

CABINET INTERNAL = 5'C to 7'C higher than Ambient!



Historical Weather For The Last Twelve Months in Manado, Indonesia.

CABINET TEMPERATURE's

NOTE:

If AMBIENT AVG is 28'C – 27' C

CABINET INTERNAL Temperature can be up to 35'C to 44"c and higher if filters not cleaned.

PowerSafe SBS

EnerSys
Power/Full Solutions

AVAILABLE TO ORDER FROM 02 SEPTEMBER 2013 !

NEW PRODUCT !

PowerSafe SB 900

EON Technolo tension

Overview of SBS 320–900

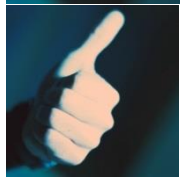
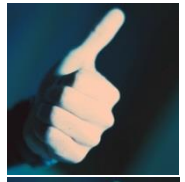
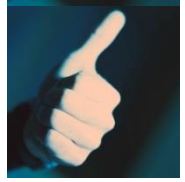
- Major extension to the highly successful PowerSafe SBS product range
  - Part of the existing, outstanding EON Technology series
- 7 brand new 2 volt single cells offering a large capacity range
  - From 320 up to 900Ah (C_{10}/1.80Vpc/20°C rate)
- Ideally suited for hybrid telecom applications (not exclusively)
- New products combine the use of EnerSys' proven, advanced Thin Plate Pure Lead (TPPL) and EON technologies with OPzV's DIN container sizes and state-of-the-art manufacturing process
- Up to 51% increase in capacity (C_{10}/1.80Vpc/20°C) compared with equivalent OPzV sizes while still offering the outstanding features and benefits of PowerSafe SBS EON Technology
- Full production in September 2013
  - SBS 900 cells still available for trials
  - Other types available shortly (orders can be placed now)

Designed for Various Applications

Telecom (hybrid and float)	
Utilities (power generation and distribution, oil and gas, etc.)	
Large UPS installations (datacentres, etc.)	
Off-grid energy storage (power generation and distribution, etc.)	

The outstanding features and benefits of PowerSafe SBS EON Technology make the SBS 320-900 series an attractive solution for various applications

Ideal For Various Telecom Operation Modes

Hybrid	Controlled full state of charge	
	Controlled partial state of charge	
Float	Stable grids (reliable mains)	
	Semi-stable grids (grid assist)	
	Unreliable grids (uncontrolled partial state of charge)	

The SBS EON Technology is proven and trusted in all types of telecom operation modes, in particular hybrid ones (typically a battery and a diesel generator)

Battery Foot Print

- Up to 51% more Energy
  - In the same foot print!

- Or Less cabinet space !
  - For the same OPZV power

Outstanding Energy Density

PowerSafe SBS EON Cell Type	Nominal C10 Capacity (Ah) C10/1.80Vpc/20°C		PowerSafe OPzV Cell Type	Capacity Increase (%)
	SBS	OPzV		
SBS 320	320	215	4 OPzV 200	49
SBS 400	400	265	5 OPzV 250	51
SBS 480	480	320	6 OPzV 300	50
SBS 580	580	385	5 OPzV 350	51
SBS 680	680	465	6 OPzV 420	46
SBS 780	780	540	7 OPzV 490	44
SBS 900	900	705	6 OPzV 600	28

PowerSafe SBS EON Technology provides up to 51% increase in nominal C_{10}/1.80Vpc/20°C capacity compared with 'size-equivalent' OPzV cells

Outstanding Discharge Performance

EnerSys® Power/Full Solutions

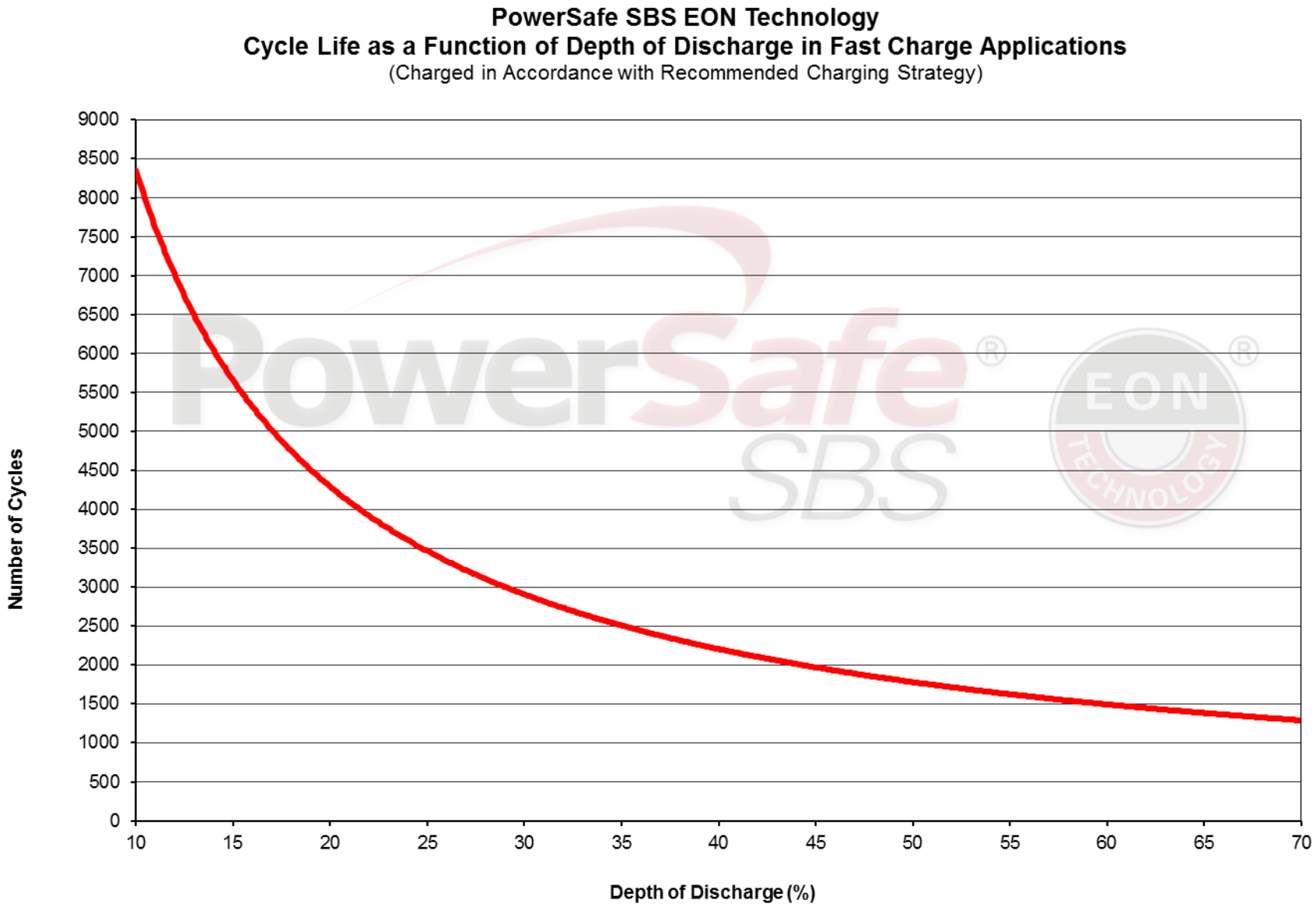
Discharge Current (Amps) @ 20°C	Type	15 min	30 min	1 hr	2hr	3hr	4hr
1.60Vpc	SBS 900	720.0	720.0	609.5	360.7	257.2	201.2
	6 OPzV 600	718.0	595.0	424.0	255.0	187.0	150.0
1.65Vpc	SBS 900	720.0	719.7	586.8	360.7	257.2	201.2
	6 OPzV 600	649.0	548.0	405.0	255.0	187.0	150.0
1.70Vpc	SBS 900	720.0	719.7	556.8	358.0	257.2	201.2
	6 OPzV 600	576.0	494.0	379.0	251.4	187.3	150.2
1.75Vpc	SBS 900	720.0	683.2	518.1	342.9	255.2	201.2
	6 OPzV 600	500.0	436.0	344.9	238.3	182.5	149.3
1.80Vpc	SBS 900	704.4	605.8	469.9	320.1	242.6	195.5
	6 OPzV 600	422.0	375.0	302.2	218.1	171.0	140.9
1.85Vpc	SBS 900	593.1	519.3	412.5	289.4	222.4	181.4
	6 OPzV 600	376.0	336.0	273.7	202.9	161.2	133.6

Note: The above-mentioned SBS 900 discharge data are subject to confirmation in October 2013. Performance data for all other types to be also available in October

Significant Benefits of SBS EON Technology

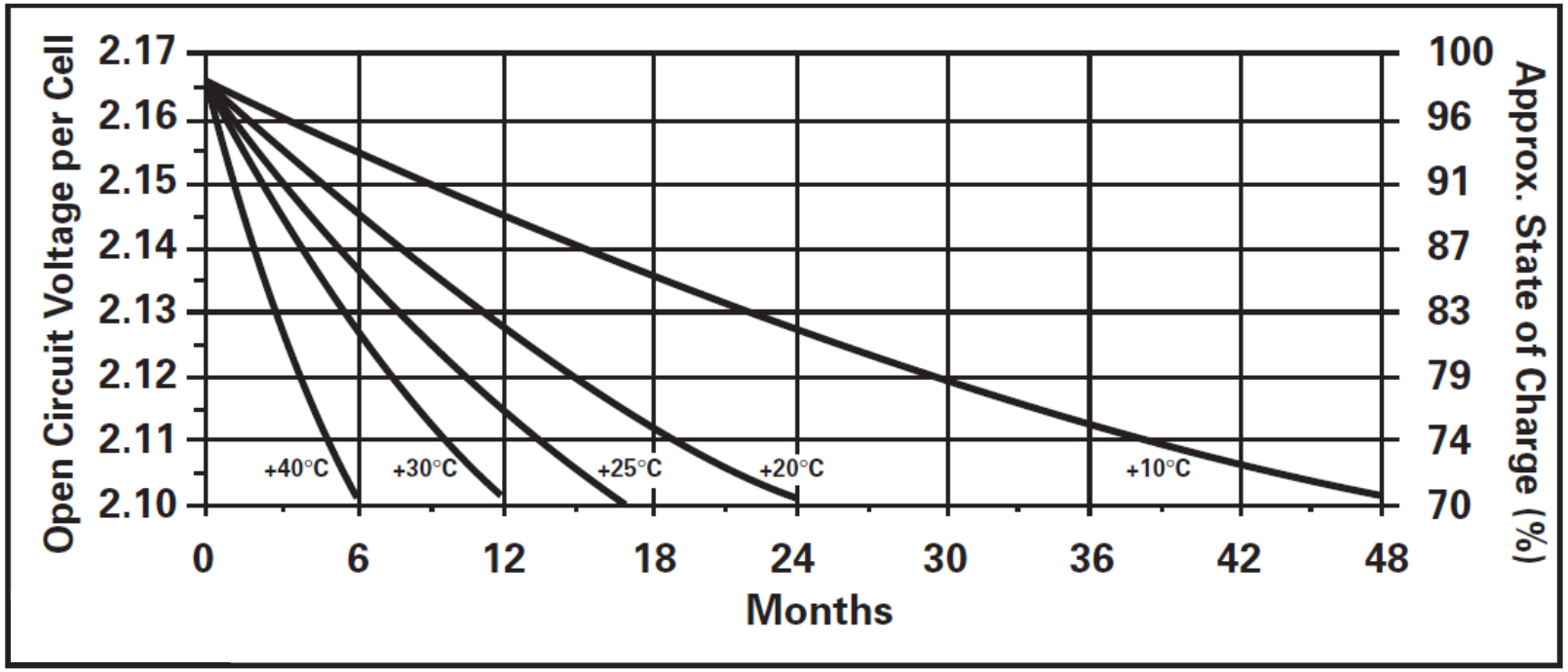
- Superb charge acceptance rates for fast recharge capability
  - Ideal for hybrid systems
  - The generator's run time to achieve the battery's full state of charge is significantly reduced
  - This leads to a very competitive total cost of ownership
    - **Lower generator maintenance / replacement costs, comprehensive savings in fuel consumption…**
- Significantly more energy and power than a conventional VRLA or OPzV battery of the same size
- Exceptional cycling performance in both float and fast charge applications
  - PowerSafe SBS EON has a proven track record in off-grid hybrid applications
- Market-leading shelf life due to low rate of self-discharge
  - Up to **24 month storage** (20°C) compared to conventional VRLA batteries
- Resilient to hot and harsh environments
  - Wide operating temperature range (-40°C to +50°C) for greater application flexibility

Superb Cycling Performance

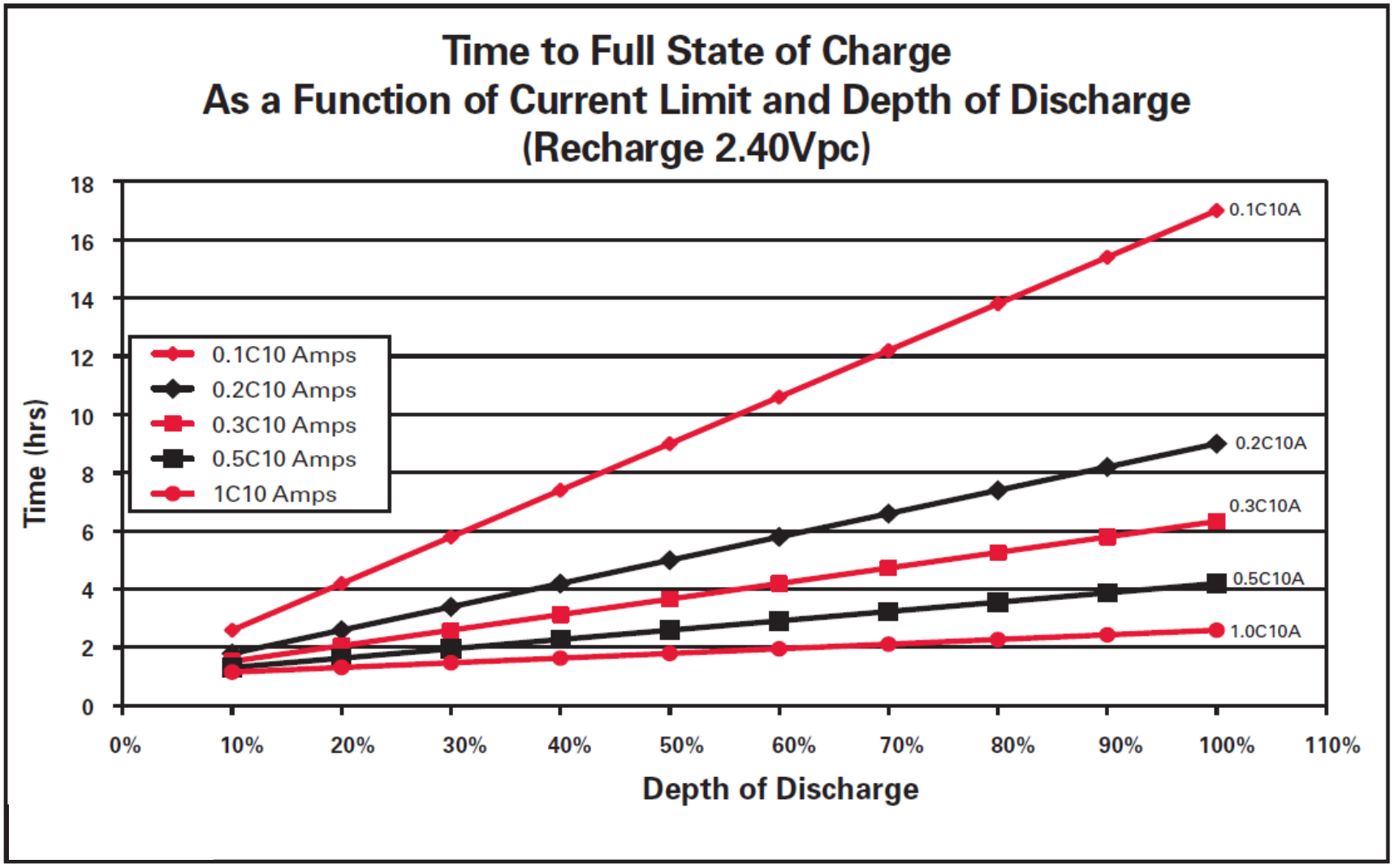


Class-Leading Shelf Life

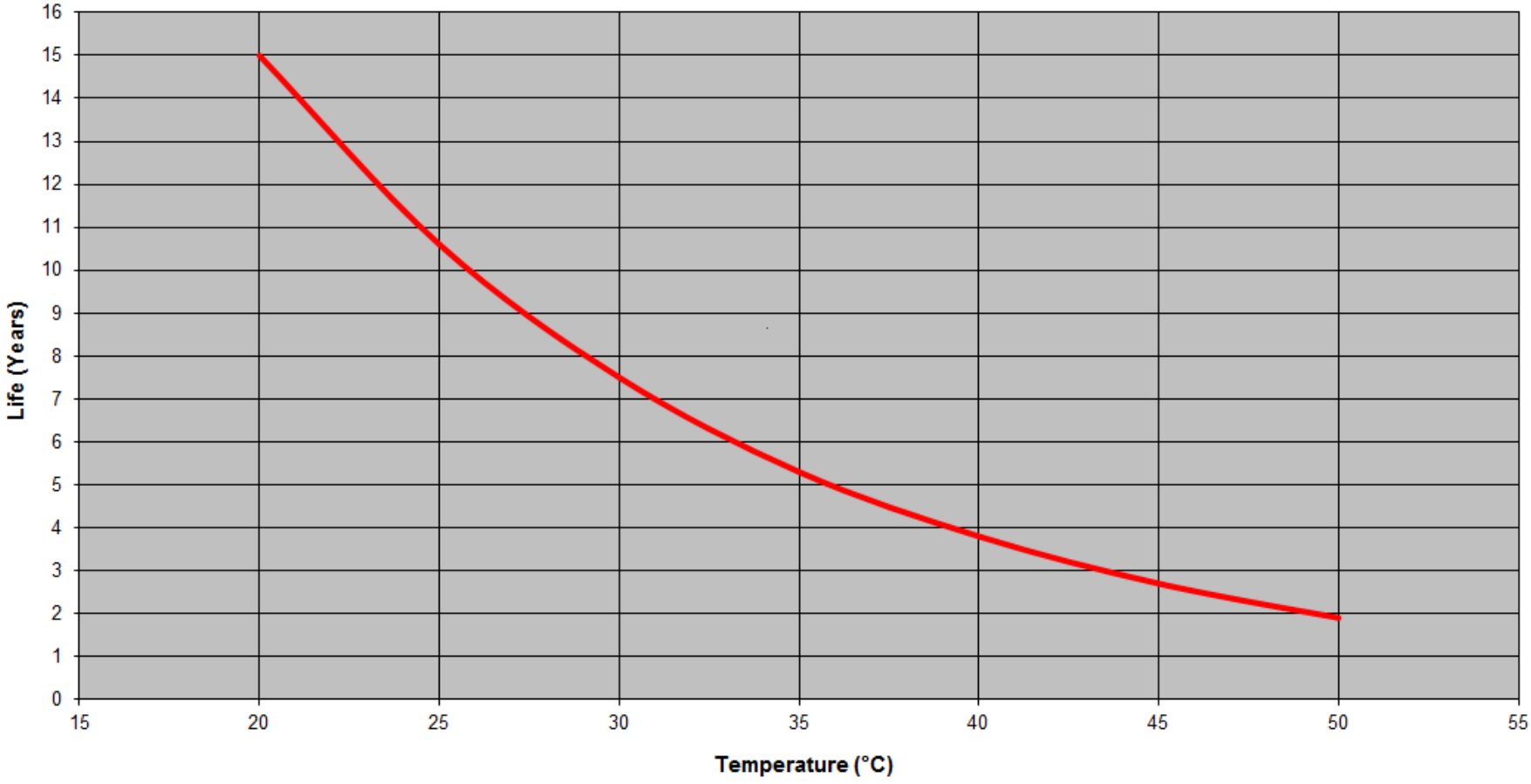
- PowerSafe SBS 320-900 cells have a shelf life of up to 2 years when stored at 20°C
- The graph below demonstrates the relationship between storage time, open circuit voltage (OCV) and state of charge as a function of temperature



Short Recharge Times



Excellent Design Life (Float, 20°C)



Typical Construction

- Tough, flame retardant UL94 V-0 rated PC/ABS container and lid
  - Polymer highly resistant to shock and vibration
  - A special two-component resin is applied evenly to guarantee a consistent box to lid bonding
- High performance Thin Plate Pure Lead positive plates
  - Grids designed to resist corrosion and prolong active life
- Negative plates - provide perfect balance with the positive plates to ensure optimum recombination efficiency
- Superior quality, low resistance microporous glass mat separators
  - High absorption and stability properties for acid-free operation
- Electrolyte: high grade dilute sulphuric acid absorbed into separator material for reduced maintenance (no water addition required)
- High integrity & quality, leak-resistant pillar seal
  - Proven in service on several other product ranges
- Self-sealing, low pressure, relief valve prevents ingress of atmospheric oxygen
- Flame arrestor fitted into each cell for increased operational safety
- Fully insulated flexible connectors supplied as standard

Focus on the Pillar Seal

- PowerSafe SBS 320-900 single cells use a high integrity, high quality pillar seal
- Design protects cells against any electrolyte leakage
- Uses a long, acid resistant, double compressed grommet
- The grommet is permanently fitted to the lid
- The high quality surface finish of the pillar ensures a perfect seal
- In the event of plate growth, terminals can slide without creating stress on the lid
- 100% seal checks on production lines

Product Marking (1/2)

Product-specific label

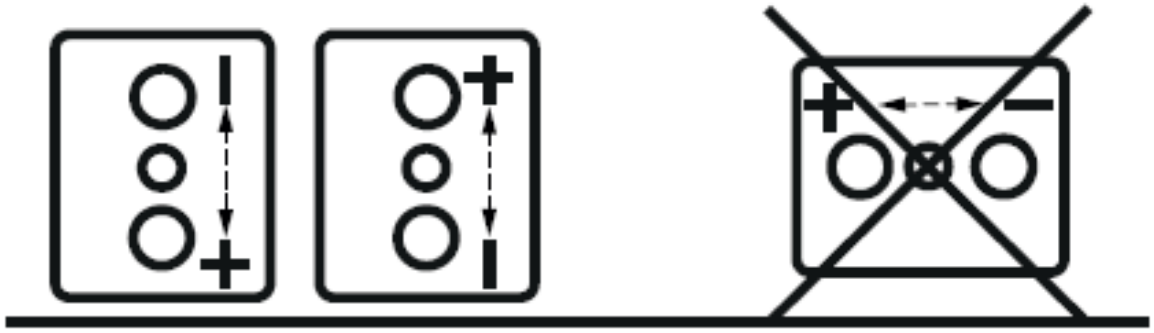
(stuck onto container)

Ink-jet printed details

(on lid)

Installation

- All PowerSafe SBS 320–900 single cells shall be installed in horizontal orientation (as shown below) to optimise rack designs and maximise battery life



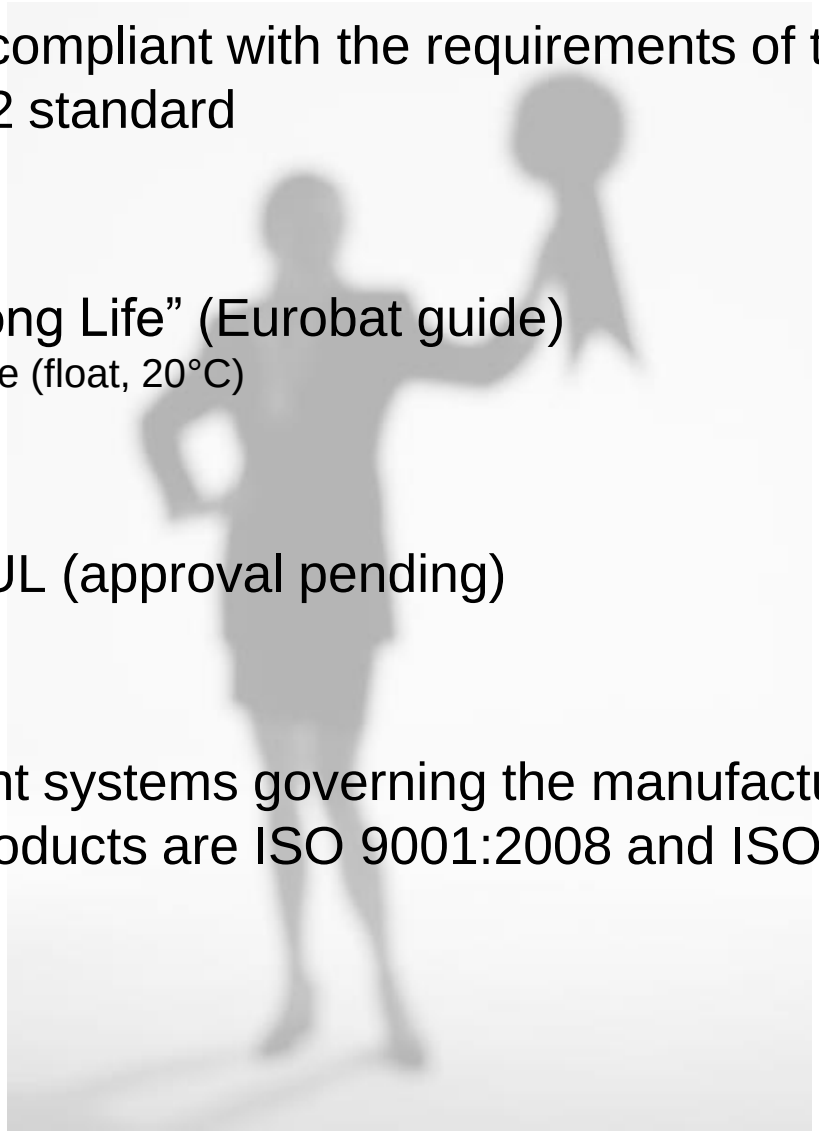
Optional Remote Gas Venting

- Ideal where limited room ventilation is available
- Gas can be vented outside the battery enclosure
- A single manifold enables gas to be remotely vented
- Vents are connected together with a flexible tube

REQUIRED FOR CLOSED LOOP COOLING ONLY

Standards

- Designed to be compliant with the requirements of the international IEC 60896-21/22 standard
- Classified as “Long Life” (Eurobat guide)
  - 15 year design life (float, 20°C)
- Recognised by UL (approval pending)
- The management systems governing the manufacture of PowerSafe SBS 320-900 products are ISO 9001:2008 and ISO 14001:2004 certified



Manufacturing Locations

Warrensburg, Missouri, USA

ISO 9001 & ISO 14001 certified factories

Newport, South Wales, UK

Manufacturing Location – 2V TPPL SBS EON

- EnerSys S.A.R.L, Arras, Northern France
- Over 40 years experience in battery manufacturing (well over *100* years for EnerSys)
- Produces cells and monoblocs for Reserve Power and Motive Power applications
- EnerSys' central logistical hub for Europe/Middle-East/Africa
- Total site area 132,302m^2 (45,000m^2 indoor)
- Circa 750 employees
- Accredited to ISO 9001:2008 for quality management and ISO 14001:2004 for environmental management

SBS 320–900 General Specification

- 7 brand new single cell types offering a large capacity range
  - 320Ah / 400Ah / 480Ah / 580Ah / 680Ah / 780Ah and 900Ah respectively

- General characteristics

			Cell Dimensions (mm)				
New SBS EON Types	Voltage (V)	Nominal Capacity (Ah) C_{10}/1.80Vpc/20°C	Length	Width	Cell Height	Overall Height	Typical Weight (kg)
SBS 320	2	320	103	206	382	403	20.0
SBS 400	2	400	124	206	382	403	24.0
SBS 480	2	480	145	206	382	403	28.0
SBS 580	2	580	124	206	498	520	33.0
SBS 680	2	680	145	206	498	520	38.5
SBS 780	2	780	166	206	498	520	44.0
SBS 900	2	900	145	206	673	695	50.0

Notes:

- *PowerSafe SBS 320-900 cells shall be installed in horizontal orientation.*
- *In horizontal orientation, the afore-mentioned heights become the lengths, lengths become widths and widths become heights.*
- *"Overall height" means height over connectors.*

Reminder: Other SBS EON Technology Products

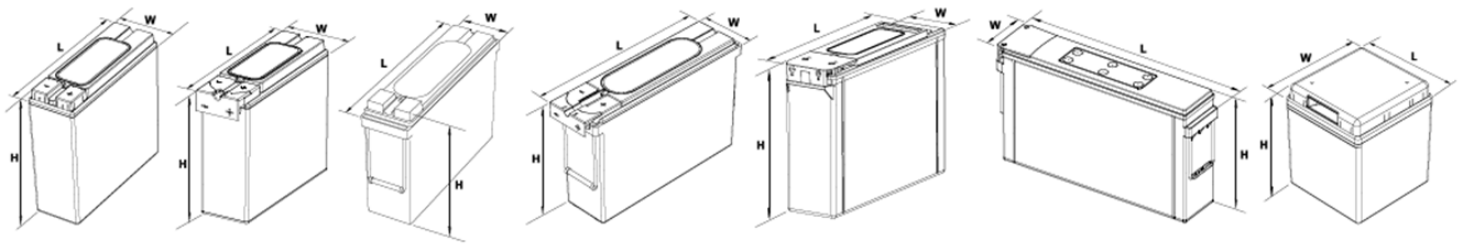
- The SBS B14… SBS 190F front terminal monoblocs and the 410 cell continue to be part of the PowerSafe SBS EON Technology range

Battery Type	Nominal Voltage (V)	Nominal Capacity (Ah) 10 hr rate to 1.80Vpc @ 20°C	Nominal Capacity (Ah) 8 hr rate to 1.75Vpc @ 77°F	Nominal Dimensions (mm) Length	Width	Height	Typical Weight (kg)	Short Circuit Current (A)[1]	Internal Resistance (mΩ)[1]	Terminals
SBS B14	12	62	62	280	97	264	19.1	1800	7.0	2 x M8 F
SBS B14F	12	62	62	303	97	264	19.1	1800	7.0	2 x M6 M
SBS C11[2]	12	92	91	395	105	264	28.0	2300	5.5	2 x M8 F
SBS C11F[2]	12	92	91	417	105	256	28.0	2300	5.5	2 x M6 M
SBS 100[2]	12	100	100	395	108	287	32.6	2210	5.6	2 x M8 F
SBS 100F[2]	12	100	100	395	108	287	32.6	2210	5.6	2 x M6 M
SBS 170F[2]	12	170	170	561	125	283	52.5	2750	4.5	2 x M6 M
SBS 190F[2]	12	190	190	561	125	316	60.0	3990	3.2	2 x M6 M
SBS 410[2]	2	410	410	200	208	239	23.2	4725	1.3	2 x M8 M

Notes:

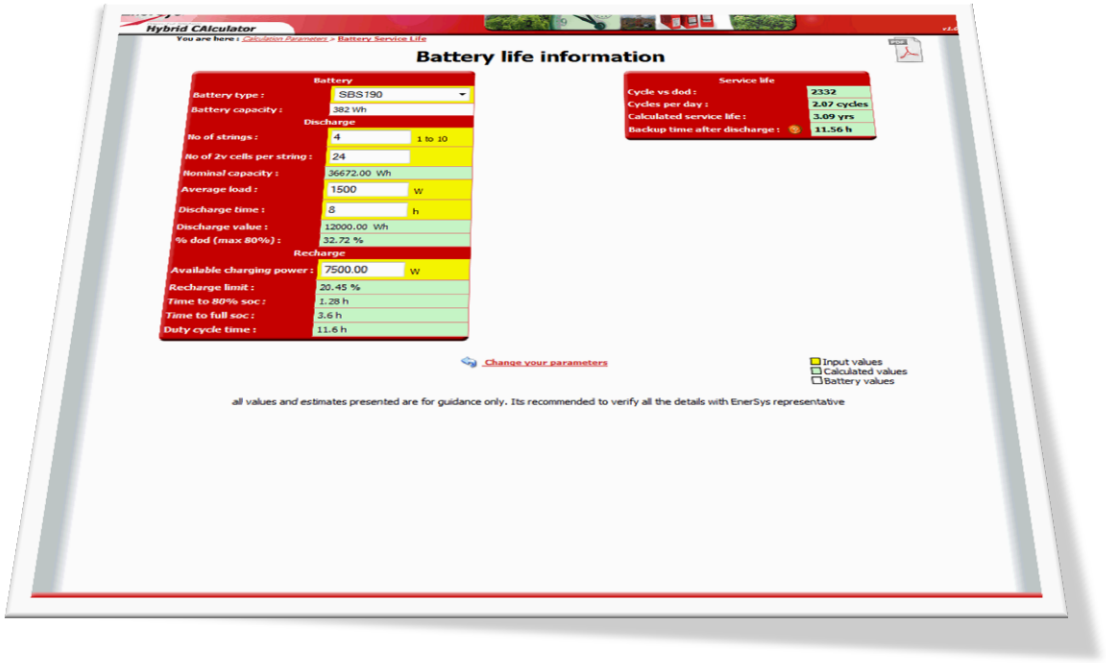
[1] Figures obtained via IEC method.

[2] With integral or rope handles.



Online Hybrid Configurator

- As you may know, EnerSys has developed a hybrid configurator tool which is available online via our Battery Sizing Program
- Please contact your EnerSys representative to obtain access



HYBRIDS - PSOC

- SBS EON for HYBRIDS

PowerSafe® SBS

EON® TECHNOLOGY

by EnerSys® Power/Full Solutions | RESERVE POWER

For more information on PowerSafe SBS or any other EnerSys battery, please contact your EnerSys Representative