

POWERSAFE[®]

Introduction to Powersafe



**RECOMBINATION STANDBY
POWER BATTERIES**

INTRODUCTION

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RANGE SUMMARY	

The **POWERSAFE** range offers choice, performance and, perhaps most important of all, complete peace of mind. Every battery in the range is manufactured to the highest standard and designed for peak performance. Used and approved by operators worldwide, **POWERSAFE** is the ultimate in gas recombination technology.



POWERSAFE is available in a range of single cells and monoblocs which can be connected in parallel to support higher capacities.

The **POWERSAFE** 'family' is not one but several closely related ranges, each covering a specific capacity range or application and each sharing the unique **POWERSAFE** technology. The VA/VB range includes the original monobloc that launched **POWERSAFE** and offers capacities from 29Ah to 518Ah. Introduction of the larger VH design increased the capacity range to 1769Ah meeting a need for batteries with fewer, larger capacity cells. Further expansion of the range includes the introduction of the VJ and VF designs with their distinctive, narrow containers and front connectors. These were primarily developed for telecommunications but are now used widely throughout industry.

Whatever the application, you can be sure there is a **POWERSAFE** battery that is just right. Furthermore whichever you chose, there is the same guaranteed performance.

It is the sort of guarantee you would expect from the world's leading manufacturer of standby power batteries. Hawker manufactures **POWERSAFE** at its Manchester plant in the UK. The company offers comprehensive customer support for **POWERSAFE** through a worldwide network of associate companies and distributors.

BENEFITS

POWERSAFE uses gas recombination technology to offer a range of benefits.

- **more power** - higher energy density than its flooded equivalent
- **low maintenance** - no topping-up, no specific gravity checks
- **fits almost anywhere** - no special ventilation required because gassing is virtually eliminated
- **safer** - enclosed construction prevents risk of acid spillage during transit or installation

For power, performance and reliability in gas recombination batteries, there's no substitute for **POWERSAFE**.



FEATURES



THE TECHNOLOGY

POWERSAFE was launched in 1982, giving birth to a new generation of standby power batteries. It was the most significant single advance in battery design for 100 years and dramatically transformed the way batteries were used.

For the first time, the standby power source could become an integral part of power equipment - a modular battery system that offered designers greater freedom and flexibility.

POWERSAFE led the move to gas recombination technology in standby power and remains at the forefront of technical innovation, continuing to set the standard for performance and reliability. Although initially developed for telecom applications, **POWERSAFE** is now used by many other industries who have recognised the immense benefits of gas recombination technology.

The technology has evolved and the range expanded to meet industry's changing requirements. However, quality has remained the key to **POWERSAFE'S** continuing success around the world. Every stage of the manufacturing process is rigorously controlled to BS EN ISO 9001:1994 to ensure product quality and consistent performance throughout the whole range.

POWERSAFE meets the flame retardancy standard IEC707 Category V0. BS6290 Part 4 defines tests and a classification system which provide a basis of expectation of in-service criteria for the operator.

POWERSAFE is tested to this standard and published data reflects its use.

In the event of an accident, **POWERSAFE** can contain its own short circuit current without risk of fire or explosion. The long life of the product makes it ideal for installation as an integral part of the standby system.

CHARGING

For normal, continuous operation of a **POWERSAFE** battery, use only a constant potential charger.

POWERSAFE batteries are usually connected in parallel with the charger and load circuit and maintained in a fully charged state. To ensure maximum service life, it is important to maintain the 'float' voltage within specified limits and full details on this and other aspects of charging are covered in the **POWERSAFE** Instruction Manuals for each range.



HOW GAS RECOMBINATION WORKS

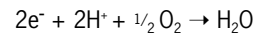
When a charge current flows through a fully charged conventional lead acid cell, electrolysis of water occurs to produce hydrogen from the negative electrode and oxygen from the positive electrode. This means that water is lost from the cell and regular topping up is needed.

However, evolution of oxygen gas and hydrogen gas does not occur simultaneously, because the efficiency of recharge of the positive electrode is not as good as the negative electrode. This means that oxygen is evolved from the positive plate before hydrogen is evolved from the negative plate.

At the same time that oxygen is evolved from the positive electrode, a substantial amount of highly active spongy lead exists on the negative electrode before it

commences hydrogen evolution. Therefore, provided oxygen can be transported to the negative electrode, conditions are ideal for a rapid reaction between lead and oxygen:

ie. This oxygen is electrochemically reduced on the negative electrode according to the following scheme,

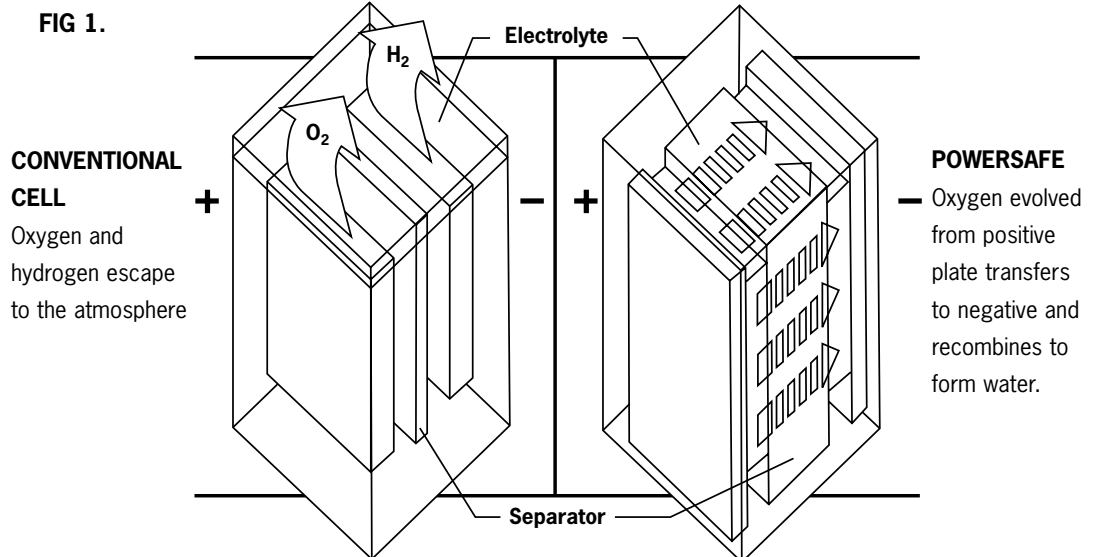


and the final product is water.

The current flowing through the negative electrode drives this reaction instead of hydrogen generation which would occur in a flooded cell.

This process is called gas recombination. If this process was 100% efficient no water would be lost from the cell. By careful design of the constituents within the cell, gas recombination between 95% to 99% is achieved.

PRINCIPLE OF THE OXYGEN REDUCTION CYCLE



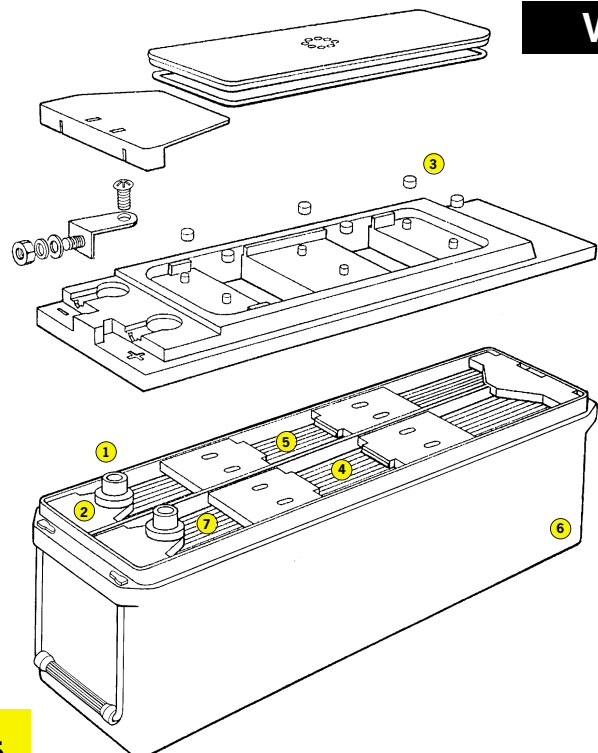
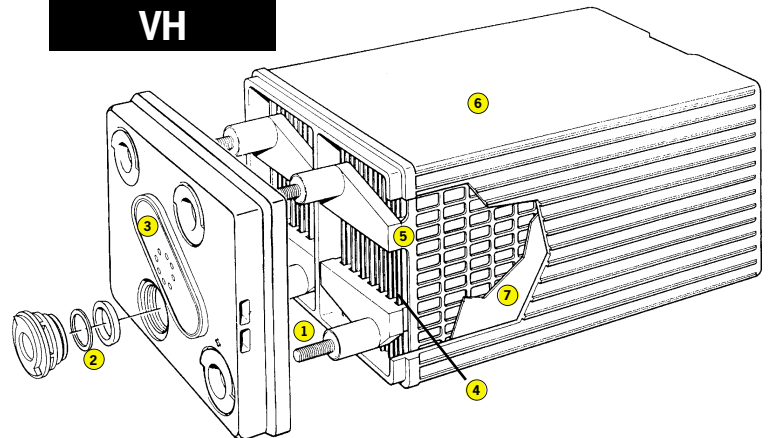
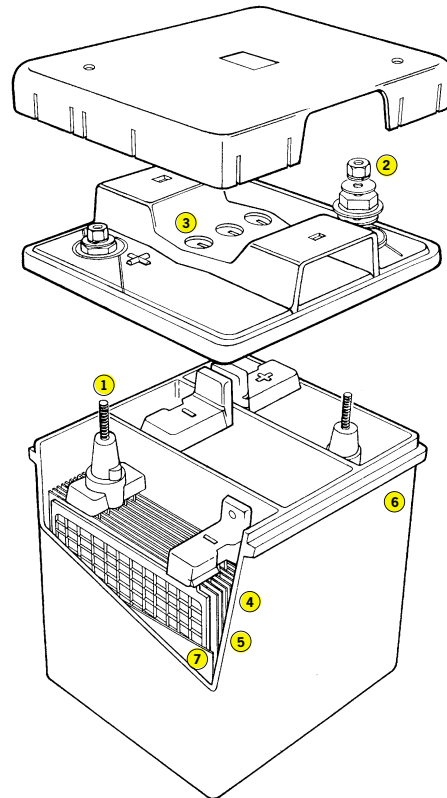
RECOMBINATION EFFICIENCY

Recombination efficiency is determined under specific conditions by measuring the volume of hydrogen emitted from the battery and converting this into its ampere hour equivalent. This equivalent value is then subtracted from the total ampere hours taken by the battery during the test period, and the remainder is the battery's recombination efficiency and is usually expressed as a percentage.

As recombination is never 100%, some hydrogen gas is emitted from **POWERSAFE** cells and batteries through the self-regulating valve. The volume of gas emitted is very small and typical average values on constant potential float at 25°C are as follows:

POWERSAFE HYDROGEN EMISSIONS	
Float Voltage V	Volume of gas emitted ml per cell per C ₃ Ah per month
2.27	1.60
2.40	10.50

- 1 HIGH CONDUCTIVITY PILLARS**
Threaded brass insert for maximum conductivity and ease of installation.
- 2 HIGH INTEGRITY PILLAR SEAL**
Compression grommet design for long life.
- 3 SELF-REGULATING RELIEF VALVE**
Low pressure non-return valve prevents ingress of atmospheric oxygen.
- 4 RUGGED SUPER-THICK POSITIVE PLATES**
Grids designed to resist corrosion and prolong active life.
- 5 BALANCED NEGATIVE PLATES**
Ensure optimum recombination efficiency.
- 6 TOUGH FLAME RETARDANT CELL BOX**
Thick-wall V0 rated ABS plastic, highly resistant to shock and vibration.
- 7 SEPARATORS**
Low resistance microporous glass fibre. The electrolyte is absorbed within this material.



APPLICATIONS



TELECOMMUNICATIONS

POWERSAFE was originally developed in co-operation with British Telecom to provide standby power for System X. Today, **POWERSAFE** is specified and used by telecom authorities world-wide for various duties including main exchanges, PABX systems and remote transmitting stations.

*Compatibility with modern exchange equipment has made **POWERSAFE** a popular choice.*

OIL AND GAS INDUSTRY

The arduous conditions experienced in off-shore exploration place particularly heavy demands on equipment including, of course, the batteries.

POWERSAFE'S rugged construction, resistance to vibration and shock, and its low maintenance requirements has made it an ideal choice. It is used widely on and off shore to guarantee the security of vital systems such as those used for emergency shut down and communications. *Compliance with the most rigorous standards qualifies **POWERSAFE** for operation in such a hostile environment.*

UPS

The guarantee of a continuous electricity supply is vital for computer systems. **POWERSAFE** has captured a large share of the UPS market thanks to its high energy density and ability to deliver high rates of discharge over short periods. The battery's compact, modular design has also made it ideal for integrating within equipment cabinets. *Total reliability of **POWERSAFE** provides security for power sensitive systems.*

POWER GENERATION AND DISTRIBUTION

Nuclear and conventional power stations depend on **POWERSAFE** batteries for vital back-up power. They are used for control and instrumentation systems, switch tripping and engine starting. Where there can be no compromise on quality, **POWERSAFE** has demonstrated an ability to meet the exacting standards of power generators including compliance with seismic requirements. *Quality in the design and manufacture of **POWERSAFE** generates confidence throughout the industry.*

AVIATION

Air traffic control systems and airport computers throughout the world rely on **POWERSAFE** batteries for essential standby power. Runway lighting and emergency lighting in terminals also need a dependable source of standby power. *The high performance, low-maintenance features of **POWERSAFE** have proved particularly important for this type of application.*

EMERGENCY LIGHTING

In public buildings, theatres, hospitals and sports arenas, emergency lighting is essential for safety and security. **POWERSAFE** batteries with their reputation for total reliability are used extensively to provide standby power for centralised emergency lighting. **POWERSAFE** conforms to the latest I.C.E.L. standards of battery performance. *Environmentally acceptable, low-maintenance batteries such as **POWERSAFE** are ideal for use in emergency lighting.*

BATTERY ACCOMMODATION

The modular concept behind the **POWERSAFE** design offers a particularly flexible standby power system which can be configured to meet a wide range of applications and site requirements. The inherent benefits of gas recombination technology - no free acid, no topping-up and virtually no gassing - mean that **POWERSAFE** products can be fitted into equipment racks or in environmentally sensitive areas with complete confidence. This ability to put standby power exactly where it is needed gives equipment designers more choice and much greater freedom.

VA/VB

These products are suitable for both stand and cabinet installations. Accommodation can vary considerably depending on the size of **POWERSAFE** bloc and the required output from the battery. Consequently, stands are individually designed to ensure the most compact arrangement whilst permitting adequate access for installation and routine maintenance. All stands are acid and fire resistant and comply fully with mechanical and safety requirements. A complete design and installation service is available.



VJ/VF

Initially developed for telecommunications applications, the VJ and VF ranges are designed to fit industry standard cabinets. As such, they offer system designers a compact standby power source that makes the most effective use of the available space. The use of front mounted terminals eliminates the need for additional access space above the blocs and makes installation and routine servicing much easier. Moulded finger grips on the smaller sizes and rope handles on the larger ones make lifting easier and assist in the removal of blocs from cabinets and stands.

VH

The combination of high capacity capability and efficient use of rack space makes the VH particularly attractive for larger installations. It can also reduce the need to have large numbers of smaller parallel connected blocs. A comprehensive range of specially designed steel racks and stands have been developed to offer a compact battery arrangement and maintain the requirements for electrical and mechanical safety. As the cells are mounted horizontally, terminal connections are made at the front leading to a more compact and accessible installation.



For more detailed information on battery accommodation and space requirements see the product guides for each range.

Range Summary

VA/VB range

Cell Type	Volts	Nominal Ah Capacity @ 20°C			Internal Resistance Ohms	Config	Height mm	Length mm	Width mm	Typical Weight kg
		1 hour rate to 1.75Vpc	3 hour rate to 1.80Vpc	10 hour rate to 1.80Vpc						
6VA7	12	19	24	29	9.4x10 ⁻³	6 cell unit	238	249	117	17.0
3VA13	6	38	48	58	2.35x10 ⁻³	3 cell unit	238	249	117	15.5
6VA15	12	49	64	75	5.16x10 ⁻³	6 cell unit	228	360	164	30.5
2VB11	4	65	80	103	1.12x10 ⁻³	2 cell unit	235	202	191	16.5
3VB11	6	65	80	103	1.69x10 ⁻³	3 cell unit	235	202	191	22.0
2VB17	4	95	120	154	0.833x10 ⁻³	2 cell unit	228	202	202	23.0
3VB17	6	95	120	154	1.25x10 ⁻³	3 cell unit	228	292	202	33.0
3VB19	6	109	139	173	1.20x10 ⁻³	3 cell unit	240	296	204	35.0
2VB25	4	143	180	231	0.555x10 ⁻³	2 cell unit	224	298	202	33.5
VB34	2	190	240	308	0.216x10 ⁻³	single cell	228	202	202	23.0
VB36	2	212	269	320	0.20x10 ⁻³	single cell	240	195	208	22.0
VB44	2	245	309	400	0.18x10 ⁻³	single cell	265	195	208	26.0
VB50	2	285	360	462	0.183x10 ⁻³	single cell	224	298	202	33.5
VB51	2	285	360	462	0.183x10 ⁻³	single cell	228	292	202	33.0
VB57	2	326	417	518	0.13x10 ⁻³	single cell	240	296	204	35.0

VH range

Cell Type	Volts	Nominal Ah Capacity @ 20°C			Internal Resistance Ohms	Config	Height mm (1)	Length mm	Width mm (2)	Typical Weight kg
		1 hour rate to 1.75Vpc	3 hour rate to 1.80Vpc	10 hour rate to 1.80Vpc						
2VH11	4	199	256	328	0.879x10 ⁻³	2 cell unit	527	266	215	49.5
2VH13	4	239	308	393	0.727x10 ⁻³	2 cell unit	527	266	215	58.0
2VH15	4	279	359	459	0.622x10 ⁻³	2 cell unit	527	266	215	66.5
2VH17	4	319	410	524	0.550x10 ⁻³	2 cell unit	527	266	215	75.0
3VH17	6	319	410	524	0.833x10 ⁻³	3 cell unit	527	431	215	117.0
3VH19	6	359	461	590	0.740x10 ⁻³	3 cell unit	527	431	215	126.0
VH22	2	399	513	655	0.222x10 ⁻³	single cell	527	266	215	49.5
VH26	2	478	615	786	0.185x10 ⁻³	single cell	527	266	215	58.0
VH30	2	558	718	917	0.158x10 ⁻³	single cell	527	266	215	66.5
VH34	2	638	820	1048	0.139x10 ⁻³	single cell	527	266	215	75.0
VH51	2	957	1230	1573	0.0925x10 ⁻³	single cell	527	431	215	117.0
VH57	2	1076	1384	1769	0.0822x10 ⁻³	single cell	527	431	215	126.0

(1) Height dimension becomes depth when installed in battery.

(2) Width dimension becomes height when installed in battery.

VJ range

Cell Type	Volts	Nominal Ah Capacity @ 20°C			Internal Resistance Ohms	Config	Height mm	Length mm	Width mm	Typical Weight kg
		1 hour rate to 1.75Vpc	3 hour rate to 1.80Vpc	10 hour rate to 1.80Vpc						
6VJ5	12	17	21	26	12x10 ⁻³	6 cell unit	228	362	65	14.5
6VJ7	12	25	31.5	39	8x10 ⁻³	6 cell unit	228	362	85	20.5
6VJ9	12	34	42	52	6x10 ⁻³	6 cell unit	228	390	105	26.0
6VJ11	12	42	52.5	65	4.8x10 ⁻³	6 cell unit	228	390	125	31.0

VF range

Cell Type	Volts	Nominal Ah Capacity @ 20°C			Internal Resistance Ohms	Config	Height mm	Length mm	Width mm	Typical Weight kg
		1 hour rate to 1.75Vpc	3 hour rate to 1.80Vpc	10 hour rate to 1.80Vpc						
6VF9	12	52	64	80	4.13x10 ⁻³	6 cell unit	228	558	105	39.5
4VF11	8	64.5	80	100	2.21x10 ⁻³	4 cell unit	228	384	125	32.0
5VF11	10	64.5	80	100	2.75x10 ⁻³	5 cell unit	228	558	125	41.0
6VF11	12	64.5	80	100	3.31x10 ⁻³	6 cell unit	228	558	125	47.0

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