

POWERSAFE PLUS

acl

Baterías
Calidad positiva



POWERSAFE NXT



SEALED MAINTENANCE FREE VRLA BATTERIES

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SEALED MAINTENANCE FREE/ VALVE REGULATED LEAD ACID BATTERIES

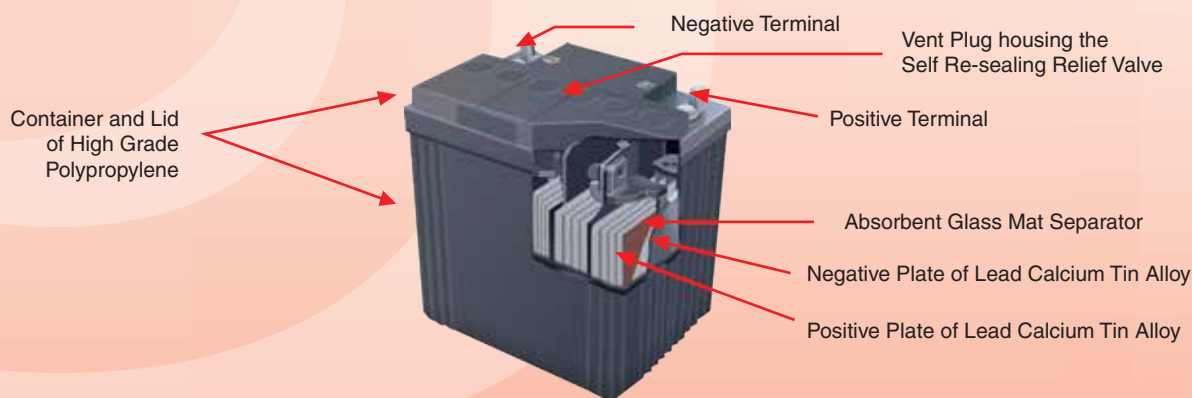
Exide Industries Ltd., the largest manufacturer of lead acid batteries in India, launched in the year 1997 the Power Pack of the future- The VRLA battery- a result of in-house R&D efforts and technical collaboration with M/s Shin-Kobe Electric machinery Co., Japan, the manufacturers of HITACHI batteries.

The VRLA battery manufactured by Exide Industries Ltd. uses AGM or "Absorbent Glass Mat" technology. The electrolyte is in absorbed condition, held within the pores of glass mat separator. The separator in turn, is tightly packed in between the positive and the negative plates.

To eliminate the harmful effects of early gassing, "lead antimony alloy" is replaced by "lead calcium tin alloy" in the plate grid structure. Very little electrolysis/gassing takes place and whatever water is converted to oxygen & hydrogen is reconverted back.

The released hydrogen is in its ionic state and, not being in gaseous form, cannot escape. The oxygen, though in gaseous form cannot bubble upwards in the absence of any free electrolyte. It has to pass through the separator pores, through electrolyte and air pockets alternately and is forced to the surface of the negative plate. The oxygen reacts with the spongy lead of the negative plate and is recombined as shown:

Therefore this battery is also known as Oxygen Recombination battery. The recombination is 100% efficient and no water is lost from the system.



At times, the rate of oxygen generation exceeds the rate of recombination due to imposition of higher than recommended charging voltages or due to operation in higher than recommended ambient temperature. This causes increase of pressure inside the battery and excess pressure is release through specially designed Self-Resealing Relief Valve, and hence the name VRLA or Valve Regulated Lead Acid Battery.

At negative electrode	At positive electrode
$2\text{Pb} + \text{O}_2 \rightarrow 2\text{PbO}$ $\text{PbO} + \text{H}_2\text{SO}_4 \rightarrow \text{PbSO}_4 + \text{H}_2\text{O}$ $\text{PbSO}_4 + 2\text{e}^- + 2\text{H}^+ \rightarrow \text{Pb} + \text{H}_2\text{SO}_4$	$\text{H}_2\text{O} \rightarrow \frac{1}{2} \text{O}_2 + 2\text{H}^+ + 2\text{e}^-$

The only limitation of this versatile battery arises from the fact that these are temperature & charging voltage sensitive. Although maintenance by way of water topping up is not required, regular checking and assurance of proper charging voltage, depth of discharge and operating temperature is needed. This is true for all the VRLA or SMF batteries.

WHY EXIDE POWESAFE PLUS

The Features

1. Sealed Maintenance free: No need for checking electrolyte level and topping throughout its life. Sealed construction ensures no leakage or seepage of electrolyte from terminal or casing.

2. Free from Orientation constraints: The sealed construction with immobilised electrolyte allows the battery to be installed in any position, horizontal, vertical, sideways- without any effect on its performance.

3. Eco Friendly: The unique gas recombination technology effectively nullifies generation of gas during normal use. It is totally eco friendly, ensuring clean and safe environment.

4. Minimal Voltage Drop: Since battery emits no gases or fumes, it can be placed adjacent to the UPS system or other electronic equipment, ensuring minimal voltage drop between battery and equipment.

5. Easy Handling - Easy Installation: Lightweight and compact. Modular construction, easy to install and easy to connect and commission.

6. Ready to Use: Available in fully (factory) charged condition.

7. Good Service Life: Between 3 to 5 years life for small and medium monobloc range (Powersafe Plus) depending on cyclic/float applications.

8. Low Self Discharge: Self discharge very low as compared to conventional flooded batteries.

9. Charge Retention & Recovery: Excellent charge retention and recovery ability due to special design of plates and separators with an absolutely balanced electrolyte.

10. Superior High Rate Discharge: Very low internal resistance and very high electrolyte- active material reactive interface- allows very high currents for short and medium duration.

11. High Reliability: Tough construction and heavy duty design with superior corrosion resistant lead calcium tin alloy.

The Benefits

● Saving hundreds of litres of distilled/ demineralised water throughout its lifetime as compared to conventional batteries.

● Saving of manpower for regular topping up and cleaning corroded terminals as in conventional batteries.

● No damage of flooring by spillage of battery acid or water during maintenance.

● No need of separate battery room.

● Can be installed by stacking together in any convenient orientation or position, thereby saving huge floor space as compared to conventional batteries.

● Saving of hundreds of square feet of costly floor spaces in metropolitan areas.

● Battery can be installed inside offices & working areas- no need for separate battery rooms, costly acid proof flooring etc. Battery can be installed in a cabinet also.

● No need for elaborate air exhaust systems as in conventional battery installations.

● Saving from transmission loss- Higher efficiency- Lower electricity consumption-Lower cost on cabling.

● Does not require specially trained technical manpower for elaborate installation and commissioning procedures.

● No delay between receipt and use. Instant power source.

● Comparable with the best international makes.

● Better than the international makes in the same capacity range.

● Can be stored for 3 to 6 months, depending on ambient temperature before recharge and without any loss of efficiency and performance.

● Lower consumption of electricity during use.

● Very long shelf life.



● Leads to greatly improved ability to recover from deep discharge.

● Requires smaller capacity (as compared to flooded batteries) for high rate discharges upto 15 mins/30 mins/60 mins duration.

● Lower size, lower cost, lower space requirement.

● Can deliver the rated performance throughout its service life.

ADVANTAGE EXIDE

- **Technology:** Manufactured in technical collaboration with Shin-Kobe Electric Machinery Co., Japan, maker of world renowned Hitachi batteries. Exide Industries Ltd. is an ISO 9001 organisation.
- **Experience:** Over 60 years of accumulated experience of Research and Development, field operations and feedback.
- **Manufacturing Base:** The only company having multi-locational manufacturing units spread across the country with ultra large manufacturing capacities.
- **Result:** Factory fresh batteries, whenever and wherever you need them. VRLA batteries come in factory charged condition and thus, the fresher they are, the better.
- **Network:** Easy availability- with 26 company branches, 30 Exide Power centres and near 1000 industrial dealers spread out all over the country.
Trained manpower at all location ensures immediate service and zero down time for your equipment. Online complaint registration through Toll Free No. 1800-103-5454.
- **Solution Provider:** Experienced engineers are available to offer total solutions regarding equipment selection, installation, operation and maintenance.
The only company in India to offer batteries from 2.5Ah - 20,000Ah and manufacturing SMF batteries from right from 7Ah upto 5000Ah.
- **Eco-Friendly Company:** ISO 140001, TS 16949, OHSAS 18001 certifications. ensuring eco-friendly production process. The only company having own smelting house and large network to collect & recycle used batteries to avoid environmental damage.
- **Recycle Symbol:** The batteries manufactured both for domestic and exports are labelled with the recycle symbol. 
- **Safety Conscious:**  Underwriters Laboratories Inc. ® USA certification for the products are available as an option.

APPLICATIONS

FOR STANDBY POWER

- ▶ UPS Systems
- ▶ Telecommunication Systems
- ▶ Office Automation Equipment
- ▶ Fire Alarm & Security Systems
- ▶ Electronic PABX Systems
- ▶ Cable Television Equipment
- ▶ Electronic Attendance & Cash Registers
- ▶ Process Instrumentation & Control
- ▶ Railway Signalling
- ▶ Power Plants & Substations
- ▶ Cellular Phones & Pagers (Base Stations & Transmitters)
- ▶ Geophysical Equipment
- ▶ PCO Monitors (Electronic)

FOR PORTABLE POWER

- ▶ Search Lights
- ▶ Portable Communication Sets
- ▶ Portable Testing & Measuring Instruments
- ▶ Medical Electronics
- ▶ Marine & Offshore Equipment
- ▶ Vending machines & Weighing Scales
- ▶ Solar Lanterns



Baterías
Calidad positiva

POWERSAFE PLUS



SMALL AND MEDIUM SIZED SEALED LEAD ACID BATTERIES

Performance Characteristics
conforming to JIS C8702

POWERSAFE PLUS RANGE

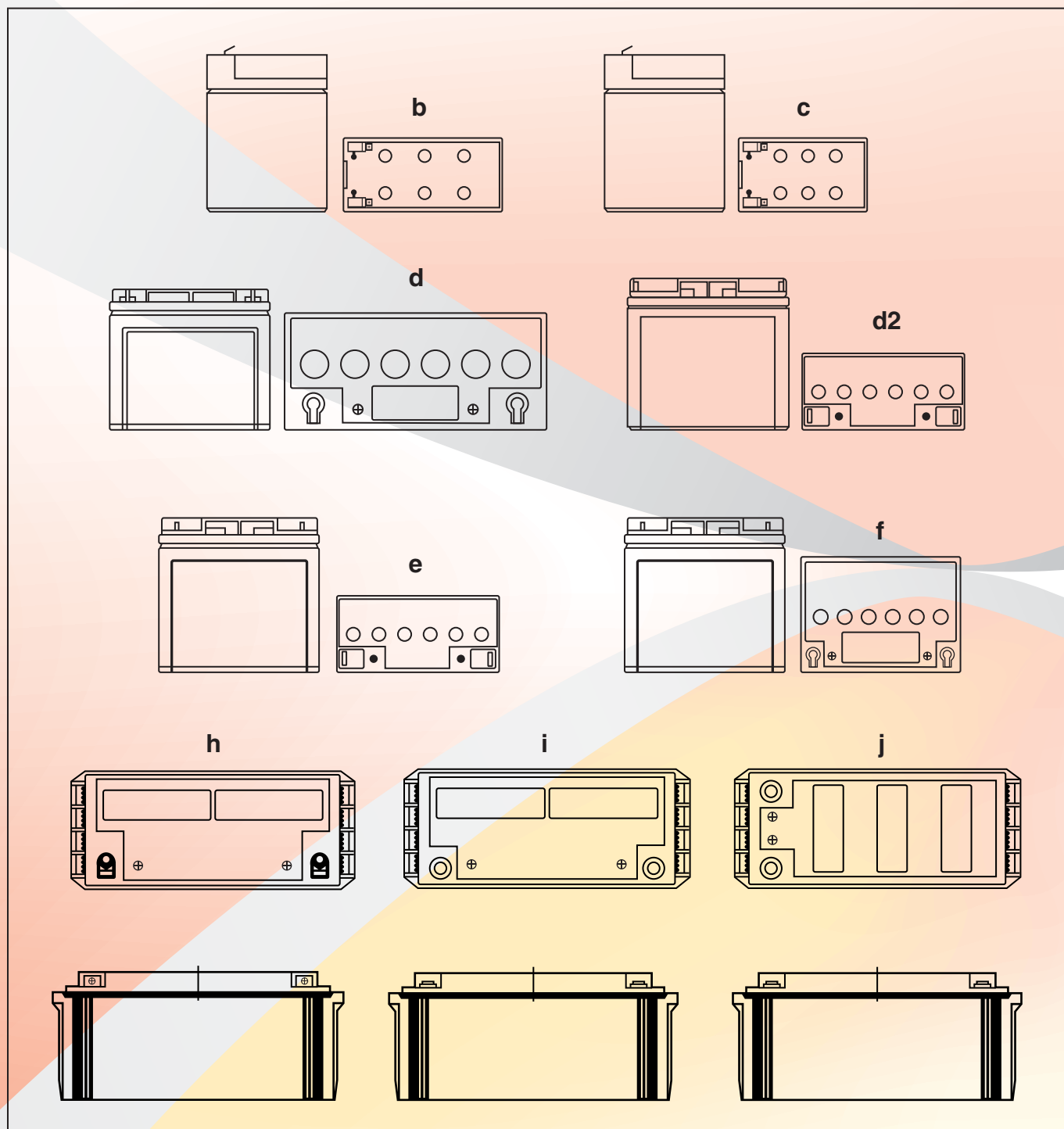
General Applications

Type of Battery	Nominal Voltage (V)	Rated Capacity (Ah) at 27 C						Dimensions (mm)				Weight $\pm 5\%$ (Kg)	Energy Density (Wh/l)	Specific Energy (Wh/Kg) Charged Condition	Internal Resistance (m-ohm) Max at fully (5 sec)	Max Discharge Current (Amps)	Container/ Lid Material	Layout	Terminal
		20hrs 1.75 V/cell	10hrs 1.75 V/cell	3hrs 1.7 V/cell	1.5hrs 1.7 V/cell	1hrs 1.6 V/cell	30min 1.6 V/cell	Overall Height (± 2)	Height up to lid top (± 2)	Length (± 1)	Width (± 1)								
EP 7.5 -12	12	7.5	6.9	5.5	5.3	4.5	3.7	100.0	94.0	151.0	65.0	2.40	92.00	37.50	22.00	105.0	ABS	b	F ₂
EP 9 -12 / EP 1234 W	12	9	8.1	6.8	6.4	5.4	4.5	100.0	94.0	151.0	65.0	2.60	110.00	42.00	18.00	135.00	ABS	b	F ₂
EP 12 -12	12	12	11.2	9.0	8.6	7.2	6.0	100.0	94.0	151.0	98.0	3.8	98.0	38.0	16.0	180.0	ABS	c	F ₂
EP 18 -12	12	18	16.9	13.7	13.0	10.8	9.0	167.0	167.0	181.0	76.0	5.0	88.5	41.5	15.0	268.0	ABS	d ₂	F ₃
EP 26 -12 W	12	26	24.0	19.5	18.7	15.6	13.0	175.0	175.0	166.0	125.0	8.8	86.0	35.0	10.0	390.0	TP10	d	F ₄
EP 26 -12 (ABS)	12	26.0	24.0	19.5	18.7	15.6	13.0	179.0	179.0	178.0	124.0	9.2	79.0	34.0	10.0	390.0	ABS	e	F ₅
EP 32 -12	12	32	29.1	24.0	23.0	19.2	16.0	179.0	179.0	178.0	124.0	9.9	97.0	39.0	10.0	480.0	ABS	e	F ₅
EP 42-12	12	42	38.5	31.5	30.2	25.2	21.0	181.0	181.0	199.0	165.0	13.9	85.0	36.3	8.0	420.0	TP10	f	F ₆
EP 65 -12	12	65	60.0	48.6	46.8	39.0	32.5	181.0	181.0	350.0	166.0	20.2	75.0	38.6	6.0	500.0	TP10	h	F ₇
EP 75-12	12	75	69.0	56.2	54.0	45.0	37.5	174.0	174.0	391.0	166.0	23.0	80.0	39.0	6.0	500.0	TP10	h	F ₇
EP 100-12	12	100	91.0	75.0	72.0	60.0	50.0	235.0	235.0	407.0	173.0	32.5	73.0	37.0	6.0	600.0	TP10	h	F ₈
EP 120-12	12	120	109.0	90.0	86.4	72.0	60.0	239.0	239.0	452.0	172.0	38.0	77.0	38.0	6.0	600.0	TP10	i	F ₉
EP 150-12	12	150	136.5	112.5	108.0	90.0	75.0	240.0	240.0	557.0	172.0	48.30	78.00	38.00	5.00	900.0	TP10	i	F ₉
EP 200-12	12	200	182.0	150.0	144.0	120.0	100.0	240.0	240.0	533.0	250.0	67.20	75.00	36.00	5.00	1200.0	TP10	i	F ₉

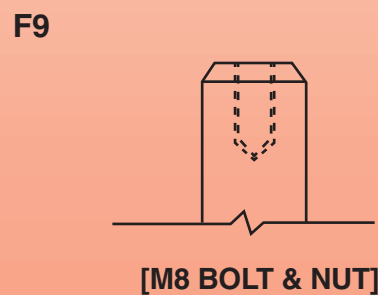
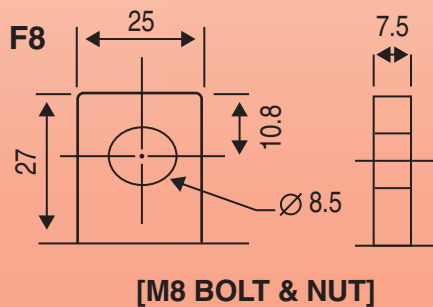
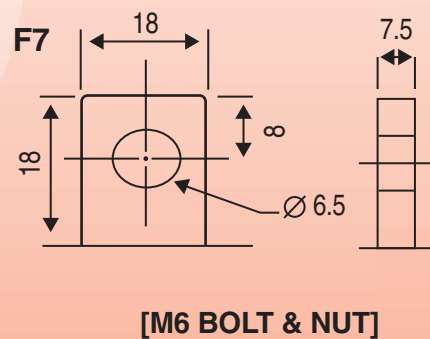
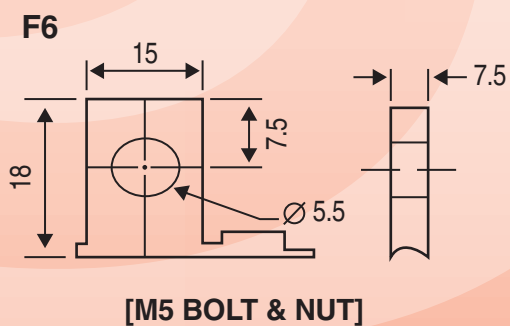
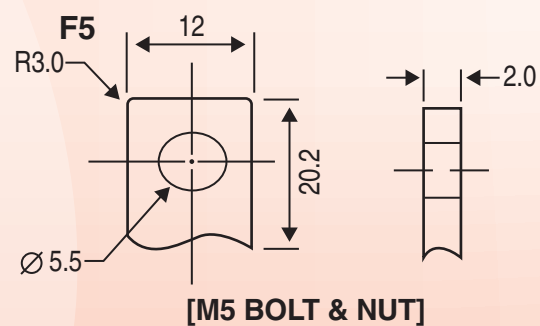
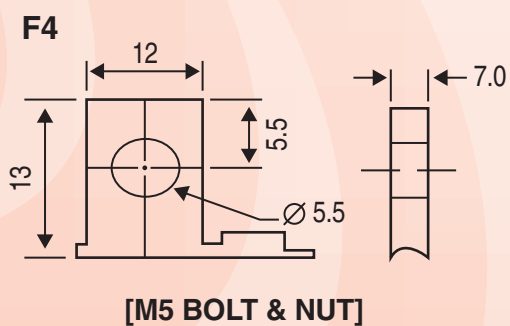
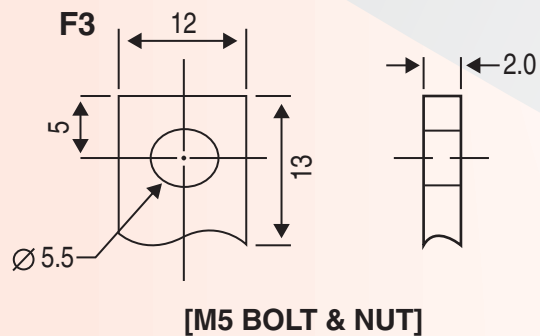
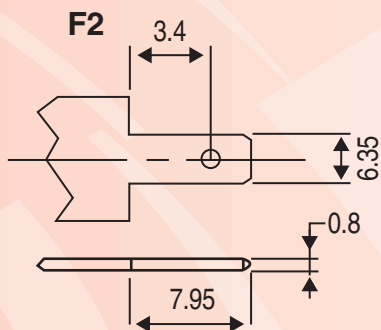
(Table 1)

Advantages: International size- matches dimension of any international equipment.
High rate performance matches or betters high rate performance of equivalent international types.

LAYOUT FOR BATTERY OUTLINE



LAYOUT FOR TERMINAL



Powersafe Plus Series

BATTERY CHARGING FOR POWERSAFE PLUS



CHARGER

'Constant Potential' chargers, with current limit facility only, are recommended for normal continuous operation.

Tolerance Temperature - Preferably 5-40°C

CHARGE LIMITS

Table (2) shows the charge voltage and limit current. The charge voltage of the battery has to be reduced with increasing temperature & increased with decreasing temperature. Accordingly, charging with a given voltage requires increased charge current when the temperature is high and reduced charge current at a lower temperature.

a) Even under high temperature, a charging voltage of 2.2V/cell is required.

b) Even under low temperature, the charging voltage must be set at less than 2.45V/cell so as to prevent gas generation from the battery.

c) The battery life will be shortened as service temperature rises.



CHARGE PARAMETERS

Recharge Voltages: Batteries to be recharged in CC-CV mode only.

Mode of Operation	Voltage settings per 12V unit for ambient temperature 20-30 deg C	Current Setting
Float	13.7V +/- 0.1V	Maximum: 0.3CA
Cyclic	14.7V +/- 0.1V	Maximum: 0.1CA
Temperature Compensation : (Reference 25 deg C) FLOAT : -18 mV / deg C / 12V unit CYCLIC : -30 mV / deg C / 12V unit		

(Table 2)

Powersafe Plus Series

CHARGE CHARACTERISTICS

Charge under constant potential charging mode at 27 °C

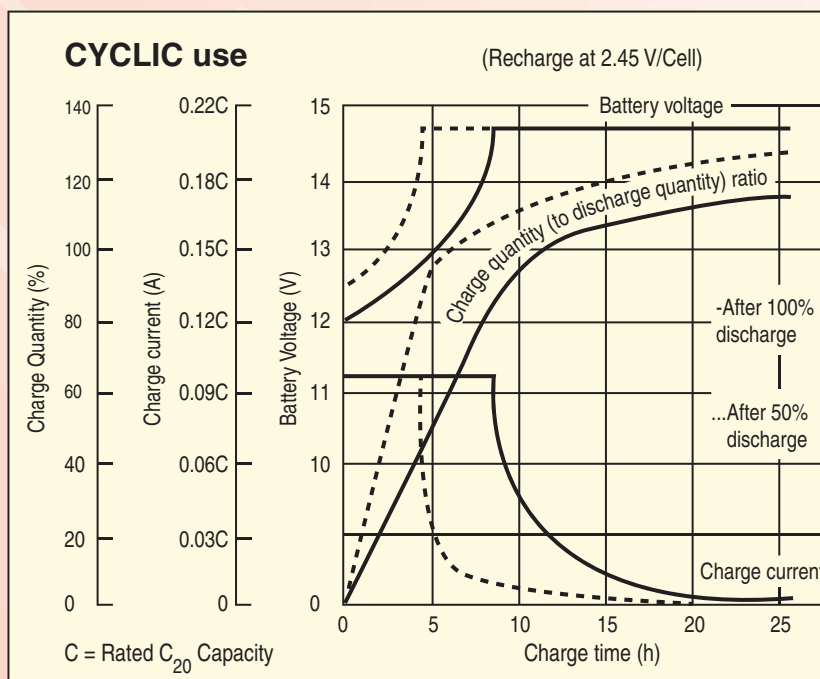


Figure (3)

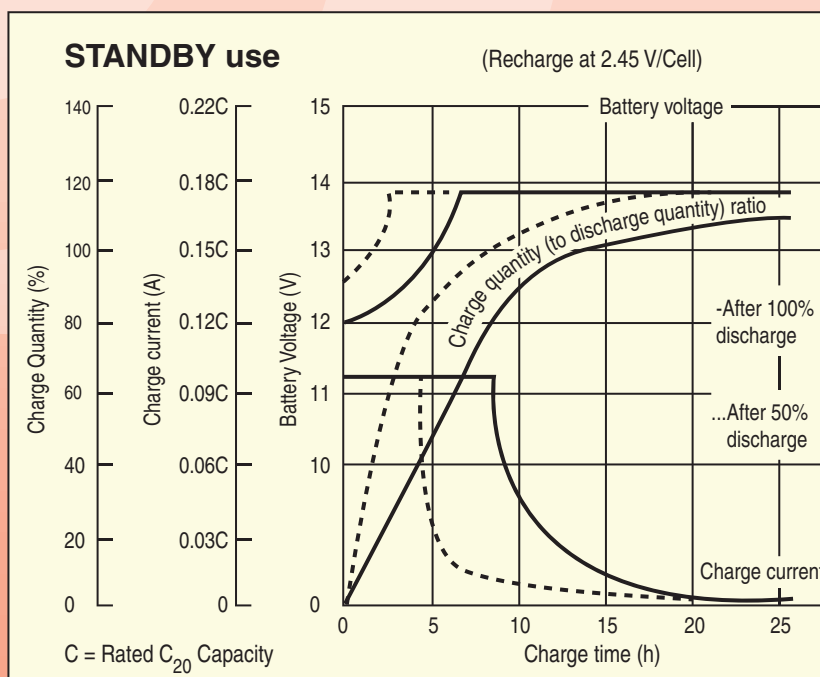


Figure (4)

SERVICE LIFE

The trend of service life of Powersafe Plus batteries under different operating conditions

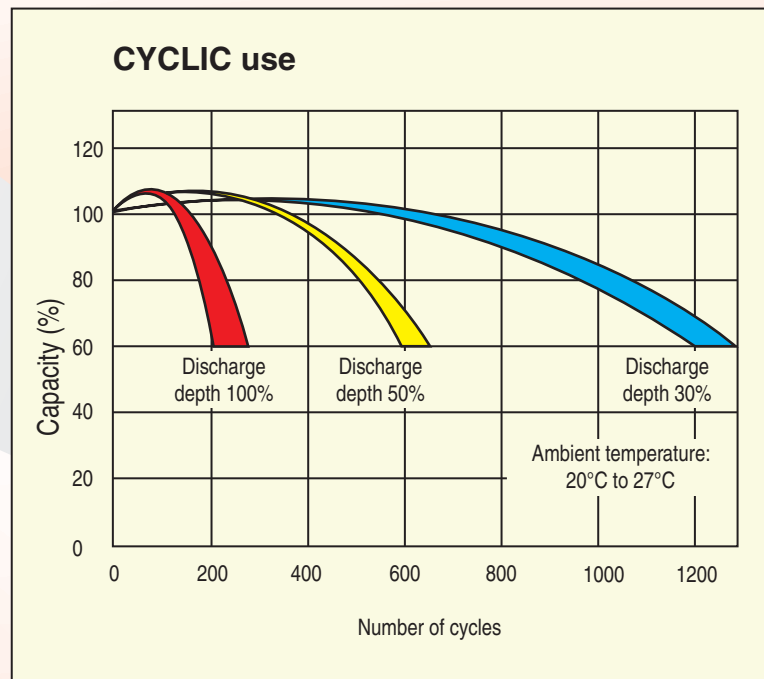


Figure (5)

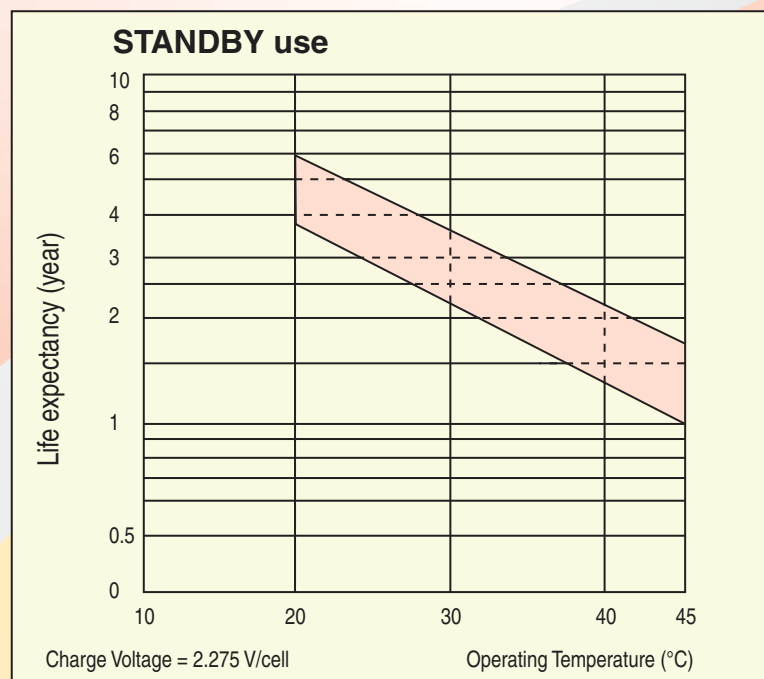


Figure (6)

CAPACITY RETENTION

Retention of Charge of Powersafe Plus Series under ideal storage conditions

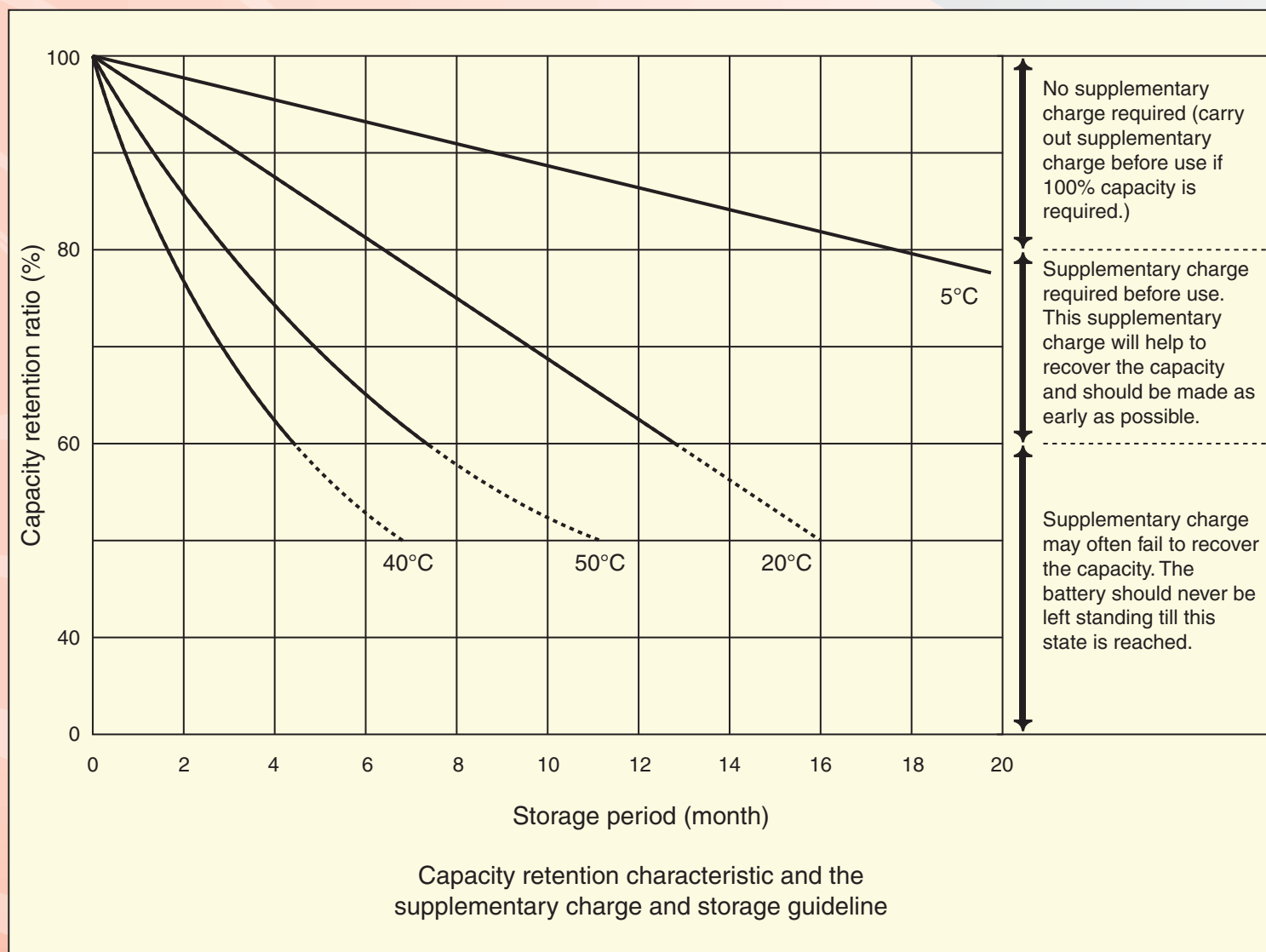


Figure (7)

Powersafe Plus Series

DISCHARGE PERFORMANCE

Maximum discharge current for various durations and cut off voltages

Discharge current in ampere to each voltage on Powersafe Plus type sealed lead acid battery

END VOLTAGE/ CELL	TEMP (C)	Discharge Time																			
		0.5min	1min	2min	3min	4min	5min	7min	10min	15min	20min	30min	1hrs	1.5hrs	2hrs	3hrs	4hrs	5hrs	6hrs	8hrs	10hrs
1.80	25	4.0C (3.2C)	3.9C (3.15C)	3.8C (3.1C)	3.7C (3.0C)	3.5C (2.8C)	3.2C (2.6C)	2.8C (2.3C)	2.3C (2.0C)	1.8C (1.65C)	1.5C (1.4C)	1.1C	0.64C	0.42C	0.36C	0.270C	0.210C	0.170C	0.145C	0.110C	0.090C
	5	3.2C (2.55C)	3.0C (2.4C)	2.7C (2.35C)	2.5C (2.3C)	2.3C (2.15C)	2.2C (2.0C)	1.9C (1.8C)	1.75C (1.65C)	1.4C (1.3C)	1.2C (1.1C)	0.95C	0.59C	0.34C	0.29C	0.230C	0.182C	0.147C	0.129C	0.098C	0.080C
	-5	2.5C (2.1C)	2.4C (2.05C)	2.2C (2.0C)	2.1C (1.95C)	1.9C (1.8C)	1.8C (1.6C)	1.6C (1.5C)	1.4C (1.3C)	1.1C (1.0C)	0.96C (0.86C)	0.76C	0.48C	0.28C	0.24C	0.198C	0.154C	0.125C	0.115C	0.087C	0.071C
1.70	25	5.6C (4.3C)	5.1C (4.2C)	4.9C (4.0C)	4.3C (3.7C)	4.0C (3.4C)	3.6C (3.2C)	3.0C (2.75C)	2.5C (2.3C)	1.9C (1.8C)	1.6C (1.5C)	1.15C	0.67C	0.48C	0.40C	0.290C	0.230C	0.190C	0.165C	0.130C	0.180C
	5	5.1C (3.8C)	4.6C (3.65C)	3.9C (3.4C)	3.4C (3.15C)	3.0C (2.8C)	2.8C (2.5C)	2.4C (2.1C)	2.0C (1.8C)	1.6C (1.5C)	1.3C (1.2C)	1.0C	0.62C	0.39C	0.32C	0.250C	0.199C	0.164C	0.143C	0.116C	0.096C
	-5	3.6C (2.9C)	3.4C (2.7C)	3.0C (2.65C)	2.8C (2.6C)	2.5C (2.3C)	2.3C (2.0C)	2.0C (1.85C)	1.7C (1.6C)	1.3C (1.2C)	1.0C (1.1C)	0.86C	0.53C	0.32C	0.27C	0.213C	0.168C	0.139C	0.123C	0.103C	0.086C
1.65	25	6.6C (4.85C)	5.9C (4.7C)	5.2C (4.45C)	4.6C (4.05C)	4.2C (3.65C)	3.8C (3.35C)	3.2C (2.85C)	2.7C (2.35C)	2.0C (1.85C)	1.65C (1.55C)	1.2C	0.69C	0.50C	0.41C	0.300C	0.240C	0.200C	0.170C	0.135C	0.110C
	5	5.6C (3.9C)	4.9C (3.8C)	4.1C (3.6C)	3.6C (3.3C)	3.15C (2.9C)	2.95C (2.6C)	2.5C (2.2C)	2.1C (1.9C)	1.7C (1.6C)	1.4C (1.3C)	1.05C	0.64C	0.40C	0.33C	0.260C	0.208C	0.173C	0.147C	0.120C	0.098C
	-5	4.4C (3.1C)	3.9C (3.0C)	3.3C (2.9C)	2.9C (2.7C)	2.6C (2.35C)	2.4C (2.1C)	2.1C (1.9C)	1.7C (1.6C)	1.35C (1.25C)	1.15C (1.05)	1.88C	0.54C	0.34C	0.27C	0.220C	0.176C	0.147C	0.125C	0.107C	0.087C
1.60	25	7.6C (5.4C)	6.7C (5.2C)	5.6C (4.9C)	4.9C (4.4C)	4.4C (3.9C)	3.9C (3.5C)	3.3C (3.0C)	2.8C (2.4C)	2.1C (1.9C)	1.7C (1.6C)	1.25C	0.7C	0.51C	0.42C	0.310C	0.250C	0.210C	0.180C	0.140C	0.115C
	5	6.1C (4.0C)	5.2C (3.9C)	4.3C (3.75C)	3.8C (3.5C)	3.3C (3.1C)	3.1C (2.75C)	2.6C (2.3C)	2.2C (2.0C)	1.8C (1.7C)	1.5C (1.4C)	1.10C	0.66C	0.41C	0.34C	0.270C	0.216C	0.182C	0.156C	0.125C	0.102C
	-5	5.1C (3.3C)	4.4C (3.2C)	3.5C (3.1C)	3.0C (2.75C)	2.7C (2.4C)	2.5C (2.2C)	2.2C (2.0C)	1.75C (1.65C)	1.4C (1.3C)	1.2C (1.1C)	0.9C	0.55C	0.34C	0.28C	0.227C	0.183C	0.154C	0.132C	0.111C	0.091C

*The number in bracket shows the discharge current of rated capacity above 18Ah. C is rated capacity at 20hrs.

(Table 3)

Powersafe Plus Series

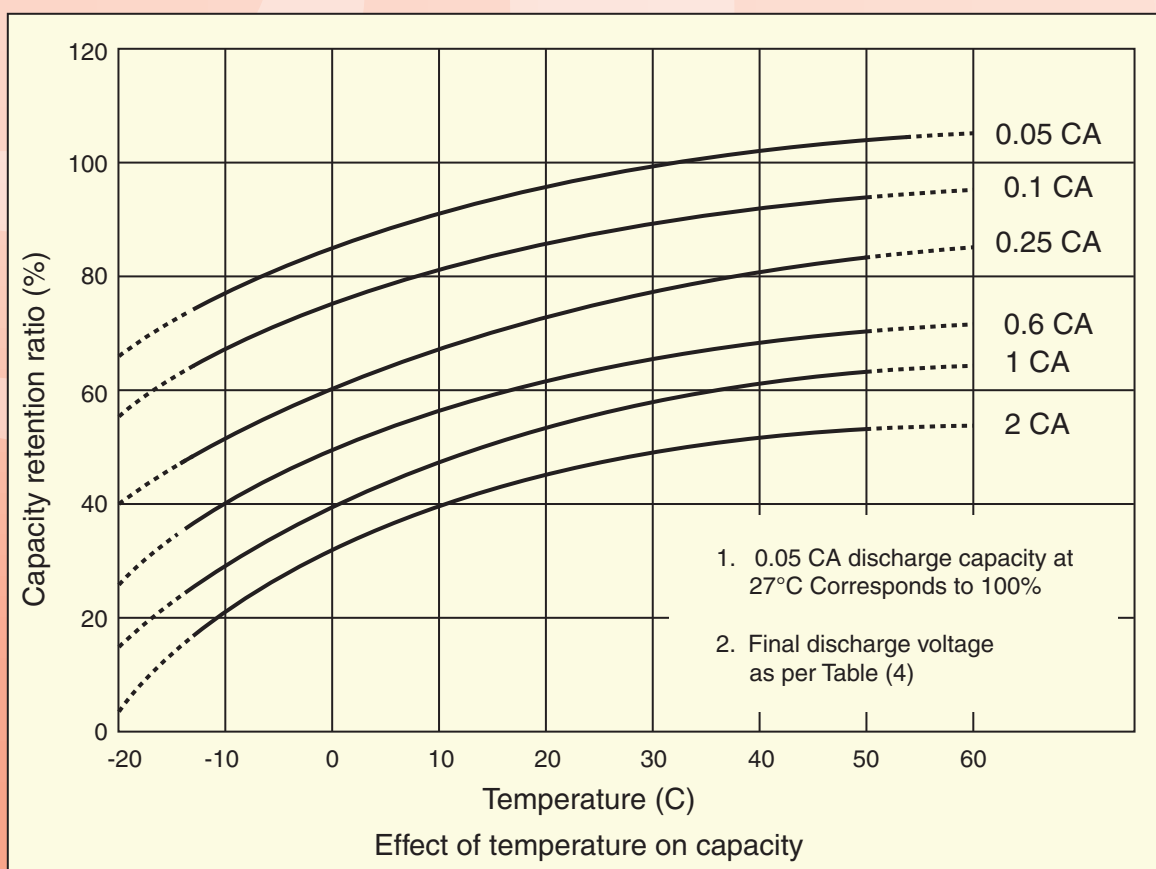
DISCHARGE CURRENT AND RECOMMENDED FINAL DISCHARGE VOLTAGE

Discharge Current (A)	Final Discharge Voltage (V/cell)
0.2 C > (A) or intermittent discharge	1.75
0.2 C < or = (A) < 0.5 C	1.70
0.5 C < or = (A) < 1.0 C	1.55
1.0 C < or = (A)	1.30

Table (4)

EFFECT OF TEMPERATURE ON CAPACITY

This figure represents the relation between the temperature and discharge capacity



Powersafe Plus Series

DISCHARGE CHARACTERISTICS

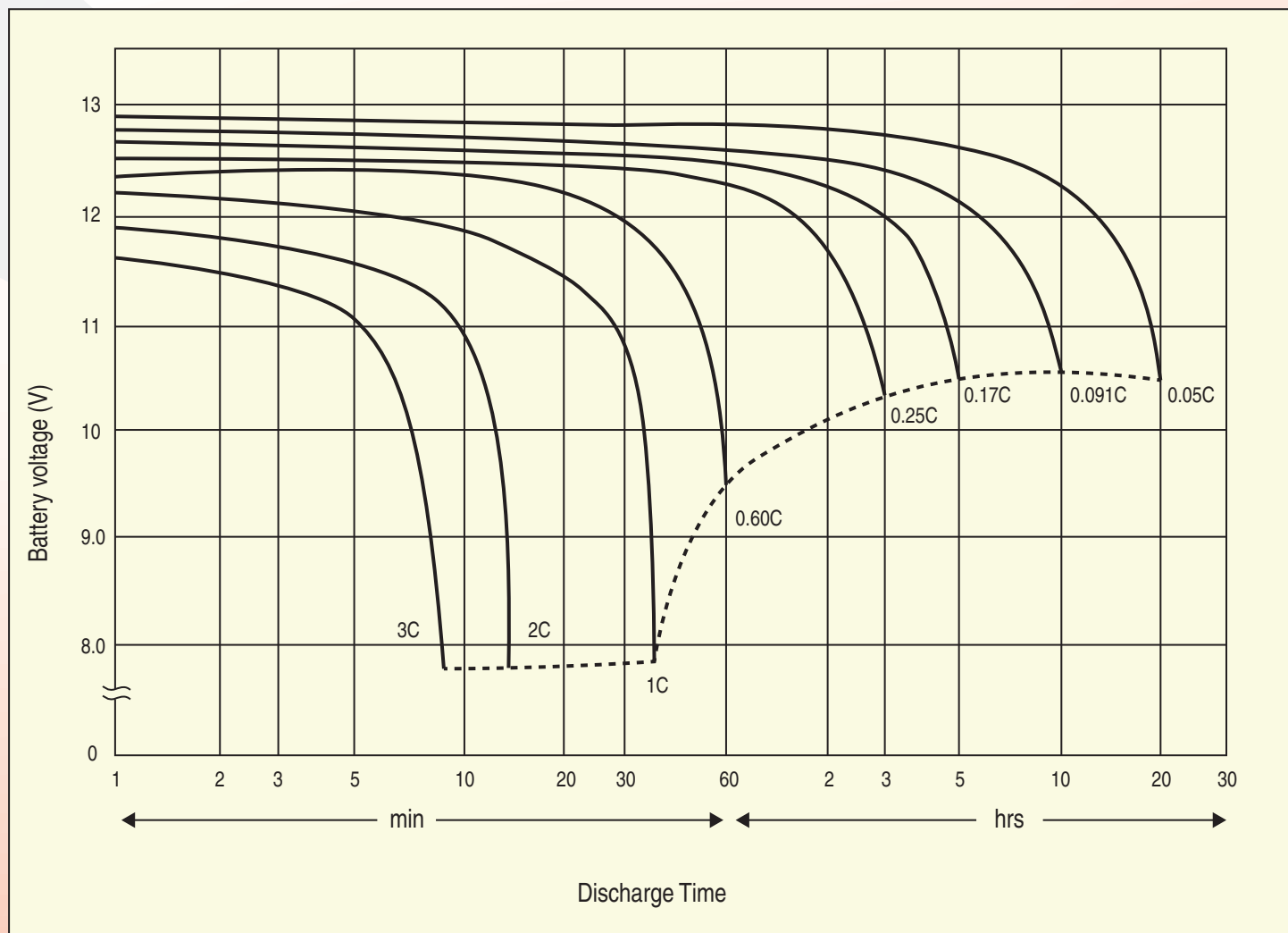


Figure (6)

C = Rated C_{20} Capacity

Powersafe Plus Series

CONSTANT POWER DISCHARGE RATINGS IN WATTS PER BATTERY FOR POWERSAFE PLUS AT 27°C

ECV	Battery Type	Discharge Time												
	Min	5	10	15	20	30	60	120	180	240	300	360	480	600
1.80	7	284	200	155	128	95	55	33	20.5	16.8	14.0	12.1	9.6	8.0
	9	298	209	163	134	101	61	38	26.5	21.6	18.0	15.7	12.4	10.3
	12	486	342	265	219	162	94	56	35.0	28.8	24.0	20.9	16.5	13.7
	18	541	376	299	248	184	220	71	50.0	40.8	34.0	29.6	23.4	19.4
	26	905	637	497	408	293	185	114	76.4	62.4	52.0	45.2	35.6	29.6
	42	1393	980	763	629	475	293	180	123.5	100.8	84.0	73.0	58.0	47.9
	65	2263	1590	1240	1022	772	470	292	191.1	156.0	130.0	113.1	89.7	74.1
	75	2534	1788	1389	1150	864	526	328	216.0	178.0	150.0	130.5	103.5	83.5
	100	3307	2323	1810	1491	1125	682	423	294.0	240.0	200.0	174.0	138.0	114.0
	120	3968	2788	2172	1789	1350	818	508	352.8	288.0	240.0	208.8	165.6	136.8
	150	4961	3485	2715	2237	1688	1023	635	441.0	360.0	300.0	261.0	207.0	171.0
	200	6614	4646	3620	2982	2250	1364	846	588.0	480.0	400.0	348.0	276.0	228.0
1.70	7	315	221	168	137	101	57	34	22.2	18.0	14.7	13.0	10.0	8.4
	9	329	231	175	143	108	73	44	28.6	23.2	18.9	16.7	13.0	10.8
	12	539	378	287	234	173	97	58	38.1	31.0	25.2	22.3	17.3	14.4
	18	600	421	321	262	194	117	73	54.0	43.9	35.7	31.6	24.5	20.4
	26	1006	705	536	436	313	193	117	82.7	67.1	54.6	48.3	37.4	31.2
	42	1548	1022	825	671	507	305	185	133.5	108.3	88.2	78.1	60.5	50.4
	65	2510	1660	1340	1090	823	496	300	206.7	167.7	136.5	120.9	93.6	78.0
	75	2816	1867	1500	1220	921	555	337	238.5	193.5	157.5	139.5	108.0	90.0
	100	3660	2416	1948	1583	1200	724	438	318.0	258.0	210.0	186.0	144.0	120.0
	120	4392	2899	2338	1899	1440	869	526	381.6	309.6	252.0	223.2	172.8	144.0
	150	5490	3624	2922	2375	1800	1086	657	477.0	387.0	315.0	279.0	216.0	180.0
	200	7320	4832	3896	3166	2400	1448	876	636.0	516.0	420.0	372.0	288.0	240.0
1.60	7	332	227	174	141	103	59	35	23.1	18.5	15.4	13.4	10.5	8.8
	9	345	217	181	146	109	67	41	29.7	23.8	19.8	17.3	13.5	11.3
	12	569	389	298	241	176	101	59	39.6	31.7	26.4	23.0	18.0	15.1
	18	632	434	334	270	200	123	77	56.1	44.5	37.4	32.6	25.5	21.4
	26	1059	716	556	449	320	200	119	85.8	68.6	57.2	50.0	39.0	32.8
	42	1630	1084	857	690	517	316	190	138.6	110.9	92.4	80.6	63.0	52.9
	65	2644	1761	1393	1121	840	513	308	214.5	171.6	143.0	124.8	97.5	81.9
	75	2961	1988	1560	1255	940	577	345	244.5	196.0	165.0	141.0	112.5	96.5
	100	3834	2569	2015	1618	1207	749	450	330.0	264.0	220.0	192.0	150.0	126.0
	120	4601	3083	2418	1942	1448	899	540	396.0	316.8	264.0	230.4	180.0	151.2
	150	5751	3854	3023	2427	1810	1124	675	495.0	396.0	330.0	288.0	225.0	189.0
	200	7668	5138	4030	3236	2414	1498	900	660.0	528.0	440.0	384.0	300.0	252.0

(Table 5)

Additional Information Regarding Exide Powersafe Plus

Heat Dissipation:

A VRLA battery under normal float condition shall dissipate heat into the atmosphere. For the overall heat load circulation, taking into account a worst case operation, the rate of heat dissipation may be taken as 0.45 Watts/100Ah C_{20} capacity/cell.

Hydrogen Evolution:

Hydrogen gas evolved by a lead acid battery may be estimated from the following formula:

$$\text{Hydrogen gas evolved per hour} = 0.45 \times 10^{-3} \times n \times I \\ \text{at N.T.P.}$$

Where, n = number of 2V cells

I = Float current, 0.2A/100 Ah for a VRLA cell

Design for the ventilation (air flow) requirement so that the hydrogen percentage in the air is always below 4% (lower explosive limit), the air flow rate may be estimated as:

$$Q = d \times s \times 0.45 \times 10^{-3} \times n \times I \text{ m}^3/\text{hr}$$

Where, d = dilution ratio $(100-4)/4 = 24$

s = factor of safety, eg. 5

For a VRLA, the above may be simplified as:

$$Q = 0.0108 \times n$$

Ripple Current:

VRLA batteries should be charged by pure D.C. source only. For optimum life the A.C. ripple content should not exceed 5A per 100Ah C_{20} capacity.

Overdischarge:

Compared to the alkaline battery, the sealed lead acid battery is very sensitive to overdischarge. And overdischarge results in failure to recover normal capacity, reduced capacity or shortened service life. Overdischarge also occurs by leaving the battery in a discharged state. The Powersafe Plus type sealed lead acid battery overcomes this. If this battery is overdischarged and left standing in a discharged state for several days, it can recover its original capacity when charged.

Powersafe Plus Series

However, it is necessary to avoid overdischarge situations as much as possible. Also check the following points when charging.

Precautions:

(1) The original capacity can be recovered after two or three consecutive overdischarges or leaving the battery in discharged state. Beyond this limit, the battery may not recover to its original capacity.

(2) Always perform constant voltage charging with a 2.45V/cell or constant current charging with 0.05 CA. The charge voltage of 2.275V/cell may not be enough to recover to the capacity above. In this case repeat charge and discharge two or three times.

Figure 10 shows an example of the charge characteristic after overdischarge and leaving the battery in a discharged state. As this figure shows, the charge current may not flow in the initial period of charge. This is not abnormal since the charge current flows as charging continues.

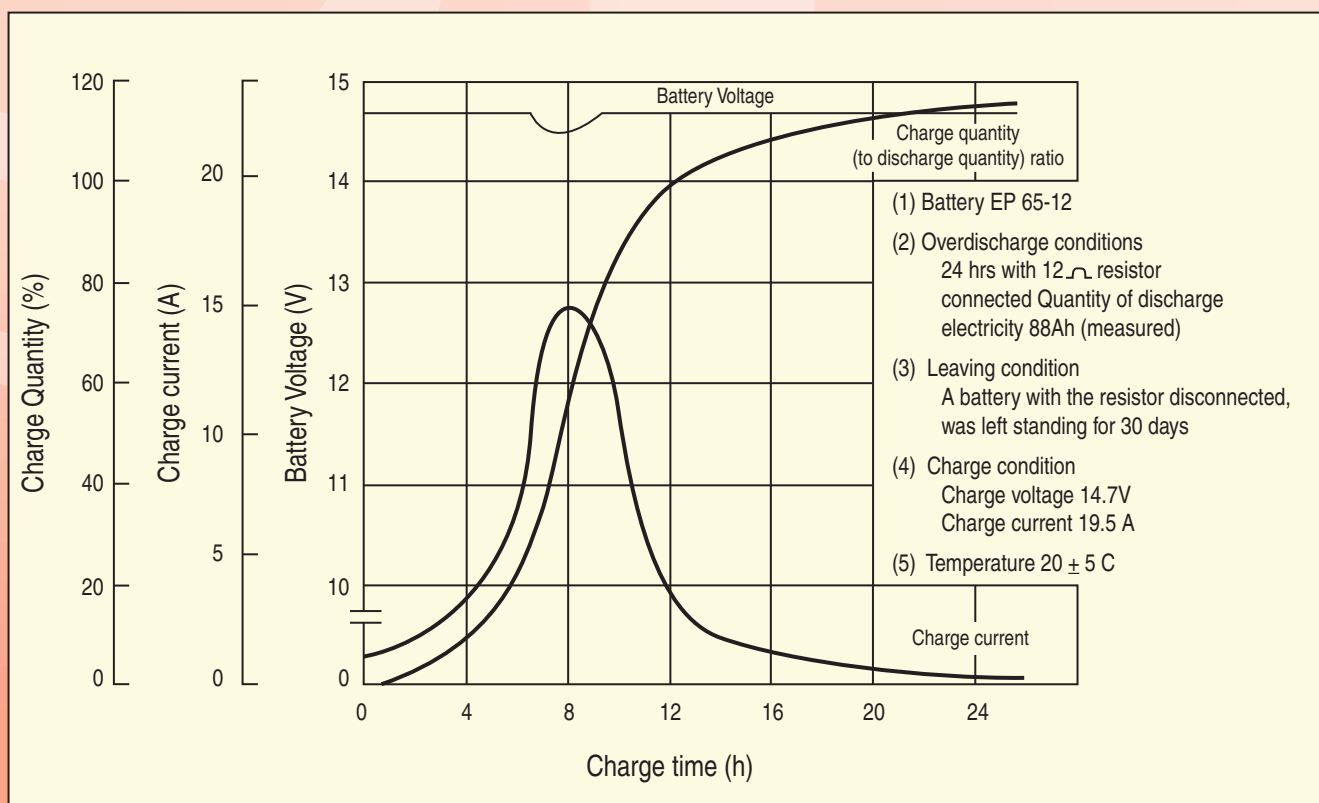


Figure (10)



Introduction: After 10 years of experience in VRLA with Shin Kobe, Exide has finally launched new Exide Powersafe NXT with the cycle life unmatched with competition nationally and internationally with its unique feature of 5 hours quick recharge option.

Features: ▶ Deep cycle application ▶ Fast recovery from deep discharge ▶ Extended cycle life ▶ Eco-friendly ▶ Fast recharge capability ▶ Excellent charge retention ▶ International size ▶ Free from orientation constraints

Specification Table:

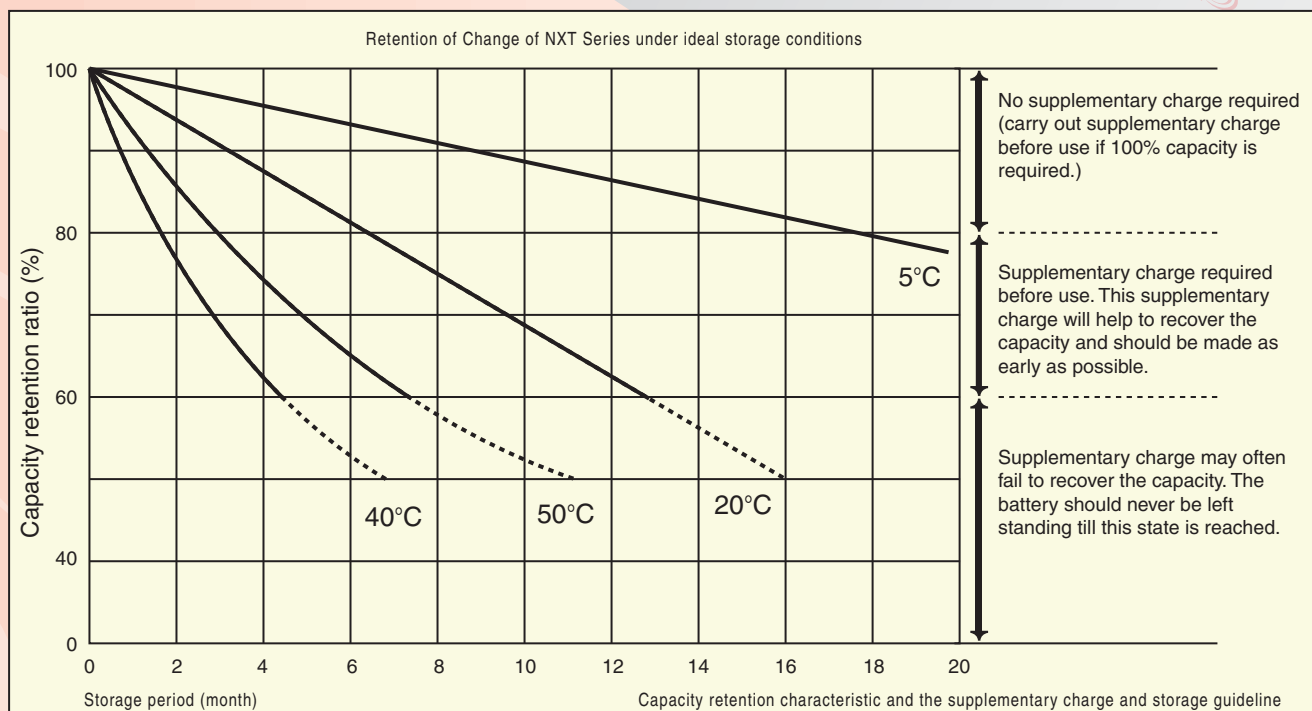
Type of Battery	Nominal Voltage (V)	Rated Capacity (Ah) at 27°C						(Dimensions in mm)				Container Lid Material	Weight 5% (kg)	Internal Resistance (m-ohm)	Maximum Discharge current (Amps)	Layout	Terminal
		20hrs 1.75 V/cell	10hrs 1.75 V/cell	3hrs 1.7 V/cell	1.5hrs 1.7 V/cell	1hrs 1.6 V/cell	30min 1.6 V/cell	Overall Height (3)	Height upto lid(3)	Length (2)	Width (2)						
NXT 17-12	12	17	16.0	12.9	12.2	10.2	8.5	167.0	167.0	181.0	76.0	ABS	5.2	15.0	225.0	F1	a
NXT 26-12	12	26	24.0	19.5	18.7	15.6	13.0	179.0	179.0	178.0	124.0	ABS	9.9	10.0	390.0	F2	b
NXT 42-12	12	42	38.5	31.5	30.2	25.2	21.0	170.0	170.0	200.0	165.0	TP10	14.8	8.0	420.0	F3	c
NXT 65-12	12	65	60.0	48.6	46.8	39.0	32.5	174.0	174.0	350.0	166.0	TP10	21.6	6.0	500.0	F4	d
NXT 75-12	12	75	69.0	56.2	54.0	45.0	37.5	174.0	174.0	391.0	166.0	TP10	24.7	6.0	560.0	F4	d
NXT 100-12	12	100	91.0	75.0	72.0	60.0	50.0	235.0	235.0	407.0	173.0	TP10	34.7	6.0	600.0	F4	e
NXT 120-12	12	120	109.0	90.0	86.4	72.0	60.0	239.0	239.0	452.0	172.0	TP10	39.7	6.0	720.0	F5	f
NXT 150-12	12	150	136.5	112.5	108.0	90.0	75.0	240.0	240.0	557.0	172.0	TP10	48.3	5.0	900.0	F5	f
NXT 200-12	12	200	182.0	150.0	144.0	120.0	100.0	240.0	240.0	533.0	250.0	TP10	67.2	5.0	1200.0	F6	f

Note: Batteries are dispatched from factory at 90% state of charge. Full capacity is achieved after a minimum ten numbers of charge-discharge cycle at full depth or 3 months of continuous float operation

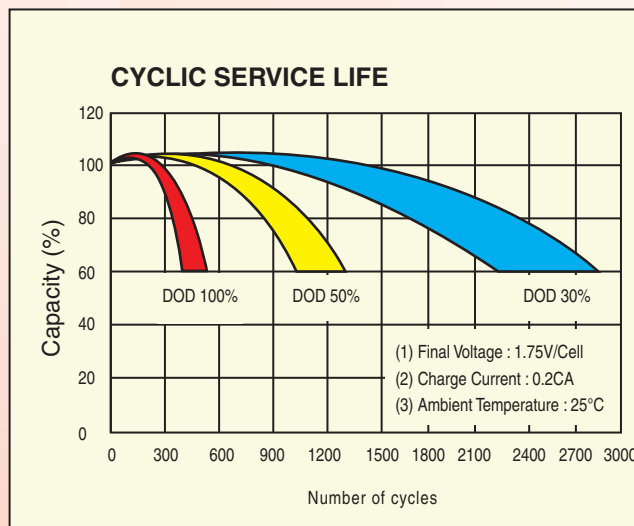
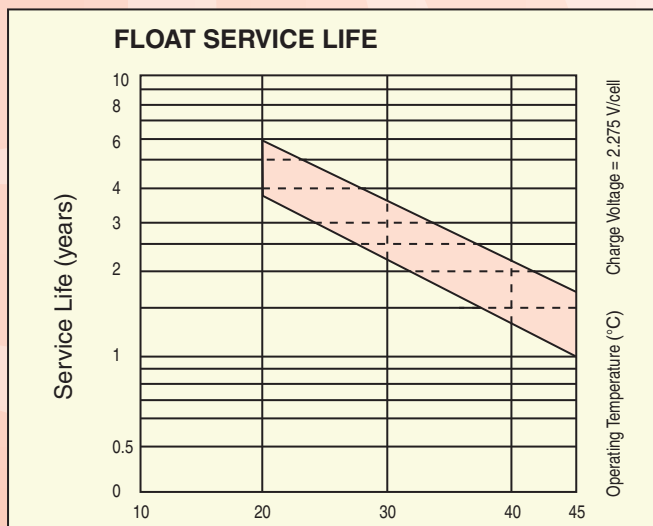
End Voltage/ Cell	Battery Type	CONSTANT CURRENT DISCHARGE TABLE FOR NXT RANGE AT 27°C															
		Max. discharge current for various durations and cut-off voltages (NXT catalogue)															
		0.5 min	1 min	5 min	10 min	15 min	20 min	30 min	60 min	90 min	120 min	180 min	240 min	300 min	360 min	480 min	600 min
1.80	NXT 17-12	3.20C	3.15C	2.60C	2.00C	1.65C	1.40C	1.10C	0.64C	0.42C	0.36C	0.27C	0.21C	0.17C	0.145C	0.110C	0.090C
	NXT 26-12	3.20C	3.15C	2.60C	2.00C	1.65C	1.40C	1.10C	0.64C	0.42C	0.36C	0.27C	0.21C	0.17C	0.145C	0.110C	0.090C
	NXT 42-12	3.20C	3.15C	2.60C	2.00C	1.65C	1.40C	1.10C	0.64C	0.42C	0.36C	0.27C	0.21C	0.17C	0.145C	0.110C	0.090C
	NXT 65-12	3.20C	3.15C	2.60C	2.00C	1.65C	1.40C	1.10C	0.64C	0.42C	0.36C	0.27C	0.21C	0.17C	0.145C	0.110C	0.090C
	NXT 100-12	3.20C	3.15C	2.60C	2.00C	1.65C	1.40C	1.10C	0.64C	0.42C	0.36C	0.27C	0.21C	0.17C	0.145C	0.110C	0.090C
	NXT 150-12	3.20C	3.15C	2.60C	2.00C	1.65C	1.40C	1.10C	0.64C	0.42C	0.36C	0.27C	0.21C	0.17C	0.145C	0.110C	0.090C
	NXT 200-12	3.20C	3.15C	2.60C	2.00C	1.65C	1.40C	1.10C	0.64C	0.42C	0.36C	0.27C	0.21C	0.17C	0.145C	0.110C	0.090C
1.70	NXT 17-12	4.30C	4.20C	3.20C	2.30C	1.80C	1.50C	1.15C	0.67C	0.48C	0.40C	0.29C	0.23C	0.19C	0.165C	0.130C	0.108C
	NXT 26-12	4.30C	4.20C	3.20C	2.30C	1.80C	1.50C	1.15C	0.67C	0.48C	0.40C	0.29C	0.23C	0.19C	0.165C	0.130C	0.108C
	NXT 42-12	4.30C	4.20C	3.20C	2.30C	1.80C	1.50C	1.15C	0.67C	0.48C	0.40C	0.29C	0.23C	0.19C	0.165C	0.130C	0.108C
	NXT 65-12	4.30C	4.20C	3.20C	2.30C	1.80C	1.50C	1.15C	0.67C	0.48C	0.40C	0.29C	0.23C	0.19C	0.165C	0.130C	0.108C
	NXT 100-12	4.30C	4.20C	3.20C	2.30C	1.80C	1.50C	1.15C	0.67C	0.48C	0.40C	0.29C	0.23C	0.19C	0.165C	0.130C	0.180C
	NXT 150-12	4.30C	4.20C	3.20C	2.30C	1.80C	1.50C	1.15C	0.67C	0.48C	0.40C	0.29C	0.23C	0.19C	0.165C	0.130C	0.180C
	NXT 200-12	4.30C	4.20C	3.20C	2.30C	1.80C	1.50C	1.15C	0.67C	0.48C	0.40C	0.29C	0.23C	0.19C	0.165C	0.130C	0.180C
1.65	NXT 17-12	4.85C	4.70C	3.35C	2.35C	1.85C	1.55C	1.20C	0.69C	0.50C	0.41C	0.30C	0.24C	0.20C	0.170C	0.135C	0.110C
	NXT 26-12	4.85C	4.70C	3.35C	2.35C	1.85C	1.55C	1.20C	0.69C	0.50C	0.41C	0.30C	0.24C	0.20C	0.170C	0.135C	0.110C
	NXT 42-12	4.85C	4.70C	3.35C	2.35C	1.85C	1.55C	1.20C	0.69C	0.50C	0.41C	0.30C	0.24C	0.20C	0.170C	0.135C	0.110C
	NXT 65-12	4.85C	4.70C	3.35C	2.35C	1.85C	1.55C	1.20C	0.69C	0.50C	0.41C	0.30C	0.24C	0.20C	0.170C	0.135C	0.110C
	NXT 100-12	4.85C	4.70C	3.35C	2.35C	1.85C	1.55C	1.20C	0.69C	0.50C	0.41C	0.30C	0.24C	0.20C	0.170C	0.135C	0.110C
	NXT 150-12	4.85C	4.70C	3.35C	2.35C	1.85C	1.55C	1.20C	0.69C	0.50C	0.41C	0.30C	0.24C	0.20C	0.170C	0.135C	0.110C
	NXT 200-12	4.85C	4.70C	3.35C	2.35C	1.85C	1.55C	1.20C	0.69C	0.50C	0.41C	0.30C	0.24C	0.20C	0.170C	0.135C	0.110C
1.60	NXT 17-12	5.40C	5.20C	3.50C	2.40C	1.90C	1.60C	1.25C	0.70C	0.51C	0.42C	0.31C	0.25C	0.21C	0.180C	0.140C	0.115C
	NXT 26-12	5.40C	5.20C	3.50C	2.40C	1.90C	1.60C	1.25C	0.70C	0.51C	0.42C	0.31C	0.25C	0.21C	0.180C	0.140C	0.115C
	NXT 42-12	5.40C	5.20C	3.50C	2.40C	1.90C	1.60C	1.25C	0.70C	0.51C	0.42C	0.31C	0.25C	0.21C	0.180C	0.140C	0.115C
	NXT 65-12	5.40C	5.20C	3.50C	2.40C	1.90C	1.60C	1.25C	0.70C	0.51C	0.42C	0.31C	0.25C	0.21C	0.180C	0.140C	0.115C
	NXT 100-12	5.40C	5.20C	3.50C	2.40C	1.90C	1.60C	1.25C	0.70C	0.51C	0.42C	0.31C	0.25C	0.21C	0.180C	0.140C	0.115C
	NXT 150-12	5.40C	5.20C	3.50C	2.40C	1.90C	1.60C	1.25C	0.70C	0.51C	0.42C	0.31C	0.25C	0.21C	0.180C	0.140C	0.115C
	NXT 200-12	5.40C	5.20C	3.50C	2.40C	1.90C	1.60C	1.25C	0.70C	0.51C	0.42C	0.31C	0.25C	0.21C	0.180C	0.140C	0.115C

C: Rated C20 capacity of the battery

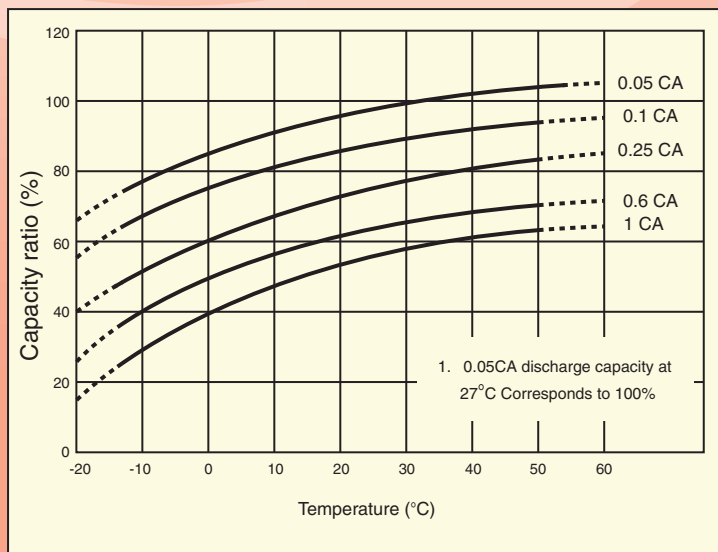
CAPACITY RETENTION



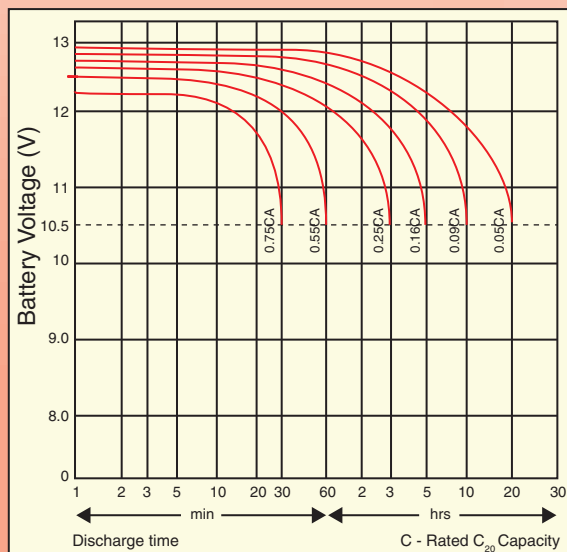
NXT SERVICE LIFE



EFFECT OF TEMPERATURE ON CAPACITY



NXT DISCHARGE CHARACTERISTICS



NOTES ON OPERATIONS:

Charging Characteristics:

a) Normal Recharge:

Batteries to be recharged in cc-cv model only

Mode of operation	Voltage setting per 12V unit for ambient temperature 20-30° C	Current setting
Float	13.7V +/- 0.1V	Maximum: 0.3 CA
Cyclic	14.7V +/- 0.1V	Minimum : 0.1 CA

Temperature Compensation : (Reference) 25° C

Float : -18mV/ °C / 12V unit

Cyclic : -30mV/ °C / 12V unit

b) Fast Recharge option:

During operation, if the battery bank is subjected to regular (daily) deep discharge in excess of 50% (cumulative basis), the fast recharge option may be exercised. Fast recharge, following pattern to be followed:-

Step 1: 0.3C - 14.5V

Step 2: 0.1C - 14.5V

Step 3: 0.05C - 14.5V

Step 4: 0.02C - 14.5V

Total duration for the four steps shall be 5.0 hours for a recharge after 70% DOD. However, this mode of recharge will require an equalization once a month at the recommended float voltage for a period of 12 hours uninterrupted.

Tolerance Temperature - Preferably 5-40°C

Caution on Ripple: The maximum limits of the A.C. content of the D.C. shall be 5A A.C.(rms) per 100 Ah C20 capacity during float charge. The A.C. current induced battery temperature rise should be below 3°C.

At all times the average D.C. float current must be kept positive.

Heat Dissipation: A VRLA battery under normal float condition shall dissipate heat into the atmosphere. For the overall heat load calculation, taking into account a worst case operation, the rate of heat dissipation may be taken as 0.45 watts/100 Ah C20 capacity/Cell.

Hydrogen Evolution: Hydrogen gas evolved by a lead acid battery may be estimated from the following formula: Hydrogen gas evolved per hour= $0.45 \times 10^{-3} \times n \times i \times C \text{ m}^3$ at N.T.P.

Where, n = number of 2V cells

i = 0.2 A/100 Ah for a VRLA cell

C =C20 capacity of Cell

To design for the ventilation (air flow) requirement so that the hydrogen percentage in the air is always below 4% (lower explosive limit), the air flow rate may be estimated as:

$$Q = d \times s \times 0.45 \times 10^{-3} \times n \times i \times C \text{ m}^3/\text{hr}$$

Where, d= dilution ratio (100 - 4) / 4= 24

s= factor of safety, eg. 5

For a VRLA, the above may be simplified as:

$$Q = 0.0108 \times n \times C$$

Paralleling of battery Strings: (a) Paralleling of a maximum of three strings is allowed provided they are all of the same make and Ah capacity and of same age. (b) Adequate care shall be taken in ensuring that all inter-unit connecting cables have equal length and cross-section. All cables to the system, from each of the strings, shall also be of same length and cross section. (c) Total charging current, in the case of parallel strings, to be taken care so that each of the strings get the recommended level of Amperes-minimum 10% and maximum 30% of the rated C₂₀ capacity of each of the 12V blocks.

For inter-block connection flexible copper cable with suitable lugs are recommended. Cable cross section may be estimated at 2.8Amps/mm² at the maximum anticipated discharge load.

Even though the Exide Powersafe batteries are designed to perform anywhere between (-)20 to (+)50°C, for optimum battery life avoid prolonged operation in ambient excess of 35°C.

Above 27°C, for every 8°C rise of weighted average operating temperature, battery life is reduced by 50%.

Test discharge on installation and commissioning, if necessary, should be conducted only after 48 hours of uninterrupted float charge with load disconnected.

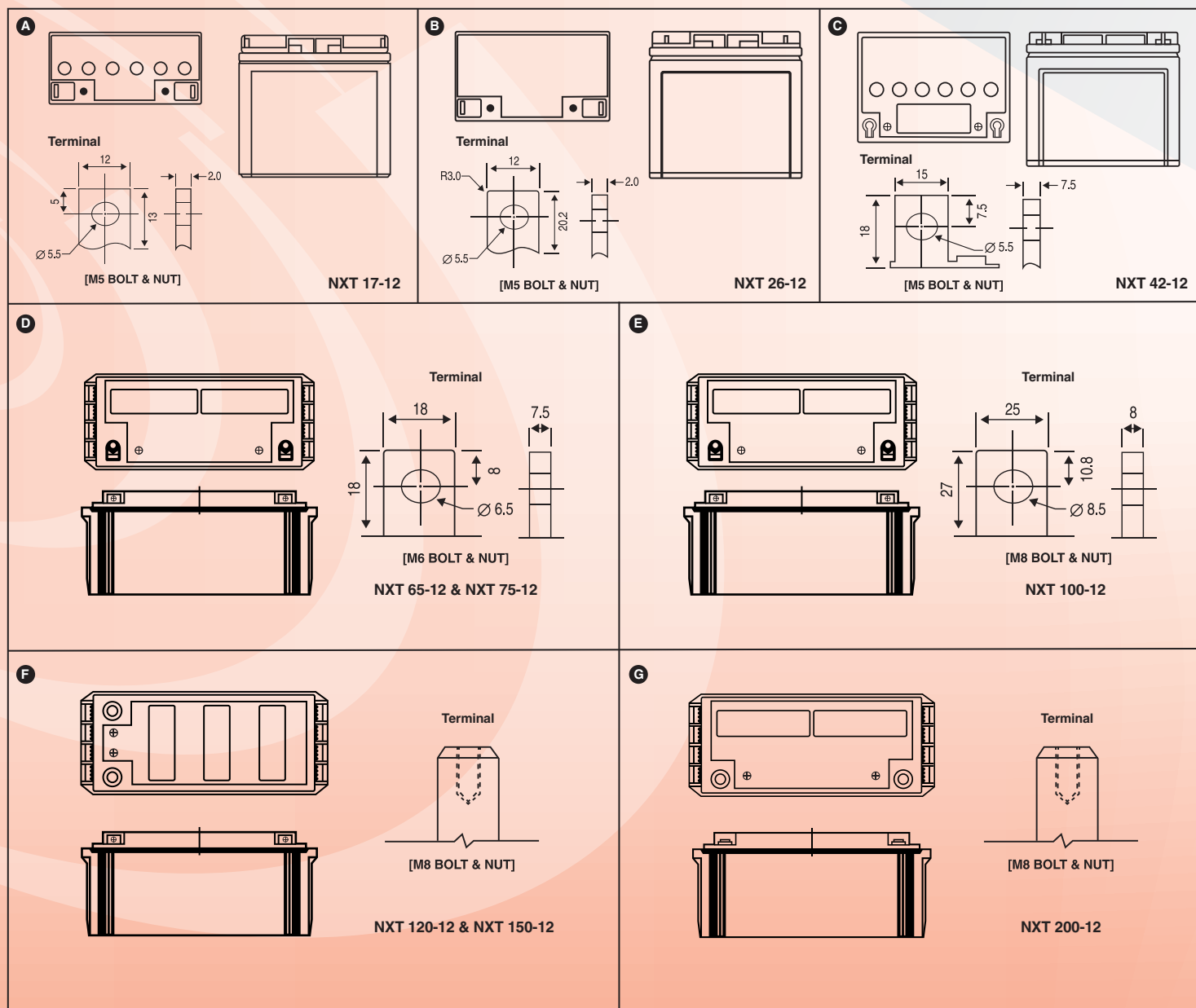
Ensure that batteries are put to recharge immediately after any discharge, under no circumstance the gap between the end of discharge and initiation of recharge should be more than 24 hours.

Standard Maintenance Recommendations: (a) Visual check every 3 months to note any physical abnormality like bulge, crack or leakage etc. (b) Measure float voltage of individual units once in 3 months and record the data. (c) Test discharge the battery bank at least once in 12 months to check battery health. (d) Keep the battery top clean with the help of a dry cotton cloth periodically. Inspect the inter-unit connection points for any sulfation etc. The inter-unit connection are to be checked for tightness once a year. (e) If battery bank is placed on steel racks/ cabinets ensure an insulation between the battery base and the steel tray. This could be a coat of durable (acid resistant) paint or any other insulating medium. Steel racks should preferably be well grounded.

Statutory notice:

All batteries contain lead, which is harmful for human beings and environment. As per statutory requirements, the used battery must be returned to the authorised dealer, manufacturer or at the designated collection centres.

LAYOUT FOR CELL OUTLINE & TERMINAL



OPERATIONAL INSTRUCTIONS FOR SMF BATTERIES

- ▶ We recommend charging the battery at an ambient temperature of 5 to 35°C to prevent any adverse effects on its effective life.
- ▶ Charge current should be 0.3CA for Powersafe Plus series (where C refers to nominal capacity and A refers to current in amps.) or less.
- ▶ In case of frequent deep discharges we recommend the charging time to be prolonged as much as 1.5 to 2 times as that of regular charging once every 5 times of discharge.
- ▶ The battery should never be left in discharged condition, otherwise the capacity to hold the charge may not be recovered. Immediate charging recommended.
- ▶ The battery should be secured against excessive impact or vibration. We recommend installation of the battery at the lowest level of the equipment and farthest from the heat source.
- ▶ New and old batteries should never be used in series. Batteries of different capacities and performances should never be used in the same bank. We do not recommend more than 4 parallel strings (of identical capacities) whatsoever.
- ▶ Discover the cause and replace any defective batteries if abnormalities noticed on voltage, temperature, electrolyte leakage or physical deformities.
- ▶ No attempts to be made to reverse charge the battery. While using a long-stored battery supplementary charging is preferred. (Constant volt: 2.45 V/cell; Constant current: 0.05 CA; Charge time: 6 to 12 hrs; Temp : 5 to 35°C.)
- ▶ We recommend transporting the battery in the upright position. Never bend the terminals nor solder directly. Always use appropriate connectors.
- ▶ If battery bank is placed on steel racks/cabinets ensure an insulation between the battery base and the steel tray. This could be a coat of durable (acid resistant) paint or any other insulating medium. Steel racks should preferably be well grounded.



OPERATING MANUAL FOR THE POWERSAFE PLUS TYPE SEALED MAINTENANCE FREE BATTERY

This manual describes precautions to be observed when operating the Powersafe Plus sealed lead acid battery (henceforth called the "battery") which requires no water addition.

General Handling Precautions Before Use:

A. Storage and Supplementary Charging

- (1) During storage, the capacity of the battery decreases due to self-discharging. Store the battery in a cool dry place, where the monthly average temperature exceeds 27°C (below 30°C), carry out supplementary charging every 3 to 6 months. Where the monthly average temperature falls below 27°C, carry out supplementary charging every 12 months.
- (2) When using a stored battery, always carry out supplementary charging before use.
- (3) For supplementary charging, refer to Table 6.

Supplementary Charge Parameters

Charging Method	Charge Time (h)	Ambient Temperature (°C)
Constant Charge Voltage at 2.45 V/cell	6 to 12	5 to 35
Constant Charge Current at 0.05 CA	6 to 12	

Table (6)

B. Transporting

- (1) When transporting the battery, never allow excessive vibration or jolting.
- (2) We recommend transporting the battery in an upright position.
- (3) When transporting a battery connected to equipment, secure it firmly and keep the circuit open.

Precaution for Design of Power Supply Unit

• Charging

A. For Standby Use (Trickle Charge or Float Charge)

- (1) Charge the battery at a constant voltage of 2.275 V/cell (20°C). When charging at an ambient temperature of 5°C or below 35°C or above, it is necessary to adjust the charge voltage in relation with the temperature.

The temperature coefficient should be -3.3mV/°C/cell.

- (2) Initial charge current should be $0.3CA$ (where C is the nominal capacity value and A is amperes) or less.
- (3) We recommend charging the battery at an ambient temperature between 5 to 35°C to prevent any adverse effects on its service life.

B. For Cyclic Use

- (1) Maintain a constant voltage charge at a voltage of 2.45V/cell (27°C). When charging at an ambient temperature of 5°C or below or 35°C or above, it is necessary to adjust the charge voltage in relation with the temperature. The temperature coefficient should be $-5\text{mV}/^{\circ}\text{C/cell}$.
- (2) The maximum charge current should be $0.3CA$ or less.
- (3) To avoid overcharging, on completion of charge, we recommend charging to be stopped or the constant voltage to be reduced to 2.275V/cell (27°C).
- (4) We also recommend charging the battery at an ambient temperature between 5 to 35°C to prevent any adverse effects on its effective life.
- (5) In case the battery has to be recharged deeply and frequently during use, to avoid poor charging, we recommend the charging time to be extended to as much as 1.5 to 2 times that of usual charging, once every five cycles of discharge and recharge.
- (6) If higher than recommended/faster charge is required, please consult us.

• Discharge

- (1) The maximum discharge current for (5 seconds) should never exceed the values in Table 1.
- (2) Final discharge voltage and discharge current should be as shown in table 3. For a particular discharge rate never discharge the battery to voltage less than the values shown in this table. Repeated, excessive discharging will shorten the battery's life.
- (3) After discharging, immediately recharge the battery. Never leave it discharged. The capacity to hold charge may not be fully recovered if the battery is left discharged for a long period.

• Installation and Connection

- (1) Secure the battery firmly to protect it from excessive vibration or impact.
- (2) When placing the battery in equipment, keep it away from heat generating parts (e.g. transformer) and install it in an upright position and as low a position in the equipment as possible. We recommend providing adequate ventilation in the cubicle.
- (3) The battery may release a combustible gas under overcharge/high ambients. Avoid installation in closed equipment or near equipment which may produce sparks (i.e. near a switch or fuse)
- (4) Using vinyl chloride sheathed wire or vinyl chloride sheet may crack the battery container and cover. Either keep it away from the battery or use a non plasticizing vinyl chloride material.
- (5) Never bend the battery terminal nor solder directly.

- (6) Avoid using the battery in the following places:
 - a. Areas exposed to direct sunlight.
 - b. Areas where there is excessive radioactivity, infrared radiation or ultraviolet radiation.
 - c. Areas filled with organic solvent vapour, dust, salt or corrosive gases.
 - d. Areas of abnormal vibration.
- (7) When connecting the battery to a charger or load, keep the circuit switch OFF and connect the battery's (+) pole to the (+) pole of the charger or the load and the battery's (-) pole to the (-) pole of the charger or the load.
- (8) Never use batteries of different capacities, batteries of different performances or new and old batteries together.
- (9) When batteries are to be used in parallel, please consult us.

Precautions during the application with UPS systems

- **Ambient temperature and installation place**

- (1) Use the battery in an environment where the ambient temperature is within the range of 0 to 45°C.
- (2) In case where more than one battery is used, the difference in temperature between batteries must be within 3°C.
- (3) The battery must be kept away from the heat source of equipment.
- (4) Install the battery at the lowest level of the equipment.
- (5) Install the battery at a well ventilated place in the structure. The ventilation ports must be provided at upper and lower levels with enough distance.
- (6) The battery case is made of plastic resin (ABS or PP resin). Ensure that it is not affected by organic solvent, oil, plasticizer etc. When fixing the battery, care must be exercised not to expose it to uneven load of screws etc.

- **Miscellaneous**

- (1) New and old batteries must not be used together in series. The time difference in product lots between batteries in a battery bank, must be within one month.
- (2) Store batteries under as low a temperature as possible. Even when batteries are kept under normal temperature, supplementary charging must be done once every 6 months.

Daily Inspection and Servicing

- (1) When the following abnormalities are observed, discover the cause and replace any defective batteries:

- a) Any voltage abnormalities
 - b) Any physical defects (e.g. a cracked or deformed container or cover)
 - c) Any electrolyte leakage
 - d) Any abnormal temperatures
- (2) Clean any dust deposition with a wet cloth. never use organic solvents (e.g. gasoline or thinners). Otherwise the container or cover may develop cracks.
- (3) When installing the battery as an emergency power supply for fire-fighting equipment, inspect it according to the Fire-Fighting Equipment Emergency Power Supply Inspection Standard or Inspection Procedure.

Other Precautions :

- (1) The battery may produce a combustible gas. to prevent a rupture, never place the battery near or in fire.
- (2) Never short circuit the terminals. Shorting may cause the battery to burn.
- (3) Never disassemble or reassemble the battery.
- (4) If the battery cracks and dilute sulphuric acid comes in contact with the skin or clothing, wash it off immediately with water. If dilute sulphuric acid comes in contact with one's eyes, wash them with a lot of water and see a doctor.
- (5) Never attempt to reverse charge the battery. This not only fails to charge the battery, but also diminishes its performance and may cause the electrolyte to leak.

Life of Battery

Generally the Powersafe Plus battery's effective life is 3 to 5 years for standby use and 200 to 250 cycles (100% depth of discharge) or more for cyclic use. The effective life may be shortened when the proper conditions are not maintained (i.e. for charging, discharging, working temperature and storage).

Fastening Bolts and Nuts

In fastening bolts and nuts, the specific torque values must be observed to prevent any damage to the terminals.

BOLT & NUT SIZE	FASTENING TORQUE
DIAMETER	N-m
M5	2.5
M6	4.9
M8	12.3

Disposal of Batteries



Lead acid batteries contain lead, acid and chemicals which are hazardous to the environment. This means that a lead acid battery needs to be disposed off carefully after its useful life is over. However, the hazardous contents are recyclable. Therefore please return these batteries after use to our dealers or any authorised smelter for careful disposal. This is also as per rules given by ministry of environment, government of India. For further clarifications contact our nearest branch.

Statutory Notice:

All batteries contain lead, which is harmful for human beings and the environment. As per statutory requirements, the used battery must be returned to the authorised dealer, manufacturer or at the designated collection centres.

- Judgement of battery life**

For judging the end of service life of a battery, reference may be made to Table 7.

No.	Item to be checked	Checking method	Criteria for judgement	Time to check
1	Actual load test	After disconnecting the batteries from the power source, keep them at rest for 1 or 2 hours, discharge the batteries under actual load, then measure the voltage.	Seek the reference time based on the standard characteristic curve corresponding to discharging condition (temperature, discharge current etc.) When the actual measured capacity is less than 80%, it is judged that the batteries have completed their life.	When the batteries have completed the average number of years of life span/ reduction in backup time.
2	1CA discharging capacity	After disconnecting the battery from the power source, keep it at rest for 1 to 2 hours, discharge with 1CA by means of a discharge test device, then measure the voltage.	The completion of the battery life span is based on less than 22 minutes of the discharge duration time (80% of the 1CA discharge capacity as per JIS).	When the battery has completed the average number of years of lifespan/reduction in backup time.
3	Float charging (Group voltage)	After confirming that the total voltage meets the designated value, measure the voltage of each battery	It is judged that the battery have completed their life span if a specific battery has indicated the voltageout of the designated range. The designated limit of voltage dispersion shall be set at 0.5V/cell.	When the battery has completed the average number of years of lifespan/reduction in backup time.
4	Appearance	Visually check the battery case, cover, terminal etc.	It is judged that the battery has completed its life span when abnormalities such as bulging of battery container, corrosion of terminal etc. are observed.	Periodical check is required since these abnormal phenomena do not necessarily occur in only the actual terminal stage of the battery life.
5	Period of time of battery use	Check the period of time for which the battery has been used by confirming the indications of date of battery replacement, date of installation or any other records.	It is judged that the battery has completed its life span when the period of time for which the battery has been used reaches the prescribed number of years.	

(Table 7)

EXIDE OFFERS PEACE OF MIND

Exide ensures Quality, Reliability and Peace of Mind through a wide range of products and services offered through a vast network of trained professionals which few can match.

Technical Services

- Technical advice on selection of proper design and capacity of the battery suitable for your requirement- FREE
- Preliminary checkup and service of your new Exide Battery and charging equipment- FREE
- Inspection of your battery systems regarding proper usage and maintenance for obtaining maximum life and performance followed by advice/corrective action
- Health check of your batteries to ascertain life expectancy
- Training workshops for your maintenance/operating personnel

Annual Maintenance Contract

We undertake annual maintenance contracts ensuring:

- Periodic checkup and preventive maintenance
- Immediate breakdown service- virtually zero downtime
- Longer life for your equipment- extra mileage out of your investment
- No wastage of man hours-100% performance and zero worries for you

Breakdown Service / Repair Service

(Pertaining to Exide make battery only)

- Timebound service on site
- First-Aid advice over telephone
- Free of cost service and spares for failure due to manufacturing defect within warranty
- Chargeable service for failure outside warranty terms



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