ABT®
Advanced Battery Technology

ELCON

VALVE-REGULATED
SEALED LEAD
ACID BATTERY

EFHP Series

High Integrity
Technical Manual

Advanced Battery Technology

Contents

Introduction

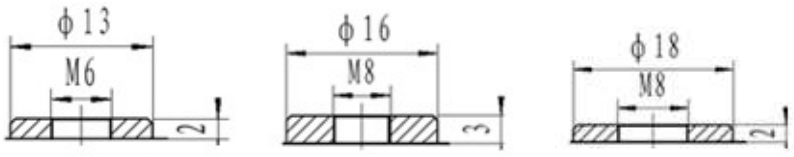
The ABT Enduro EFHP range of VRLA lead acid batteries have been designed specifically for use in Application swhich demand the highest levels of security and reliability. With proven compliance to the Most rigorous international standards.

Enduro EFHP is recognized as premium battery for Telecom/IT, Power Utilities application. Enduro's Reputation for long service life combined with excellent high rate performance also makes it the number One choice for high integrity, high specification UPS systems. The Enduro EFHP front terminal monoblocs is compact design and standard footprint for 19"and 23" cabinet.

- Thick Pb-Ca-Sn alloy grids designed to resist corrosion and prolong life
- Low resistance microporous glass fibre separator.
- Low specific acid density
- Centralized venting system for gas ventilation
- Flame arrestor to improve safety
- Rope handles for easy installation
- Pillar with brass insert where screwed an copper connector fitted with abolt and stainless nut and washers
- Design life 12 years
- Low Self Discharge
- U.L. Component Recognition
- Six months shelf life at 20℃

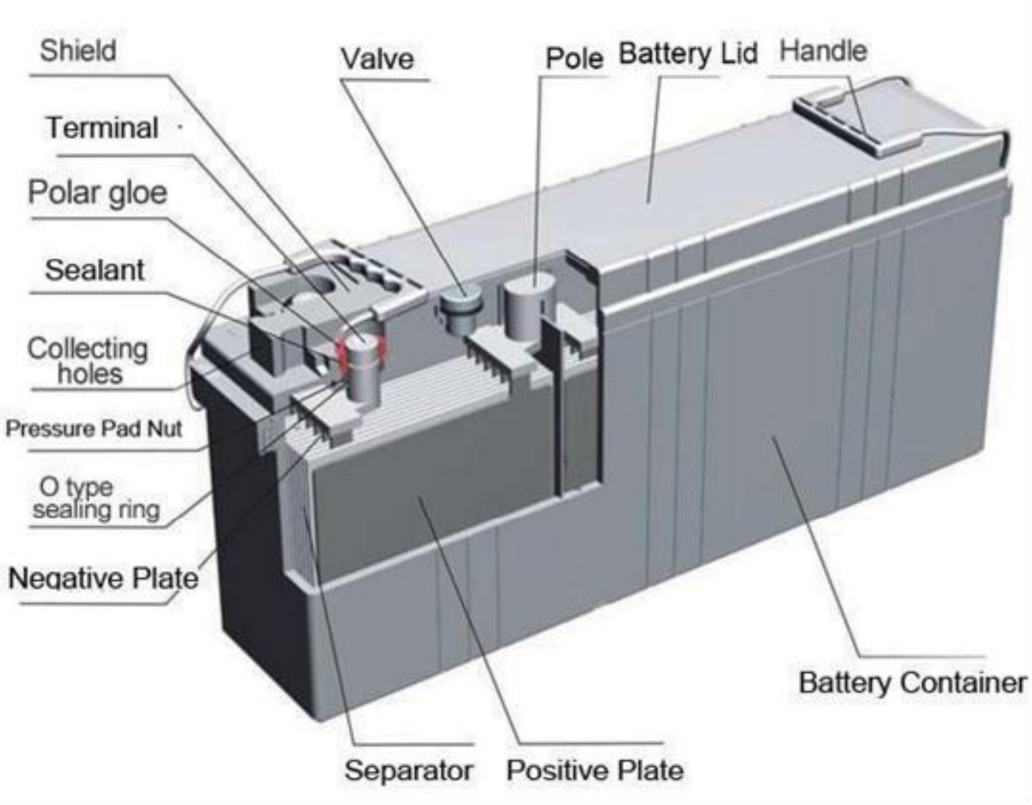
Technical Features

- **Sealed Construction**
  Unique construction and sealing technique ensures no electrolyte leakage from case or terminals.
- **AGM Separator Design**
  Low resistance microporous glass fibre separator. The electrolyte is absorbed within this material.
- **Gas Recombination Efficiency**
  ABT Enduro EFHP batteries incorporate a built-in design that controls gas generation and provides Recombination of more than 99% of gas generation during float usages.
- **Low Pressure Valve Regulated System**
  All ABT Enduro EFHP batteries are equipped with safety release valves, designated to operate between1.4 and 5 psi and automatically close. Hence there is never an excessive accumulation of gas within the battery.
- **Maintenance Free Operation**
  There is no need to check specific gravity of the electrolyte or add water to ABT Enduro EFHP batteries during float service life.
- **Terminals**
  Front terminals M6 and M8 thread inserted for easy installation and maintenance.



Construction

The construction and sealing technique of the ABT Enduro EFHP batteries guarantee leakage proof with no adverse effect to capacity or service life.



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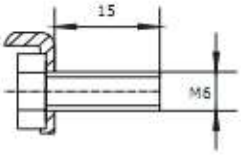

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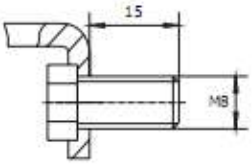
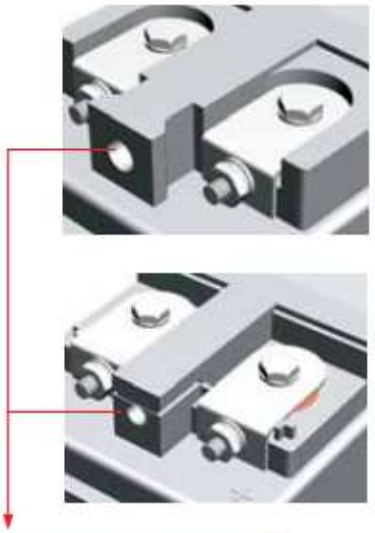




Gas collector System has been designed to collect and disperse gas evolved during normal battery operation where required.

Grids

Thick lead calcium alloy grids provide an extra margin of performance and life in floating applications and give unparalleled recovery from deep discharge.

Floating Service Life

The expected service life is 12 years in float standby applications.

Long Shelf Life

The low self discharge rate allows the battery to be stored for extended periods up to one year at normal ambient temperatures with no permanent loss of capacity.

Operating Temperature Range

The batteries can be used over a wide temperature range permitting considerable flexibility ins ystem design and location.

Discharge-20~60℃;

Charge-10~60℃;

Storage-20~60℃

Deep Discharge Recovery

ABT Enduro EFHP batteries recover their capacities even after repeated deep discharge.

Complying Standards

- IEC60896-21/22:2004
- JIS C 8702-1/2 2003
- JIS C 8704-1/2: 2006
- BS6290-4　1999
- Eurobat Guide

Certification

- CE
- GOST
- ISO9001
- ISO14001
- OHSAS18000

General Specifications

Battery Type	Nominal Voltage (V)	Nominal Capacity (Ah,20℃)		Dimensions (mm)				Weight (kg)	Max. Current (A, 20℃)		Internal Resistance (mΩ,20℃)	Terminal Type
		Ah/8h 1.75V	Ah/10h 1.80V	L	W	H	TH		In 1 min	In 1 sec		
EFTB12-50	12	46.7	50	277	105	260	260	17.8	150	800	8.93	M6×Φ12
EFTB12-80	12	76.1	80	395	105	270	270	28.5	200	1000	4.73	FT-54
EFTB12-85	12	80.9	85	395	105	270	270	28.5	260	1100	3.99	FT-54
EFTB12-100	12	99.2	100	508	110	320	320	33.2	260	1100	3.99	FT-54
EFTB12-125	12	120.8	125	551	110	320	320	48.5	200	1000	4.41	FT-55
EFTB12-150	12	145.6	150	551	110	320	320	51.0	300	1150	3.89	FT-55
EFTB12-155	12	150.5	155	551	110	320	320	51.0	300	1150	3.89	FT-55
EFTA12-100	12	97.3	100	558	125	230	230	36.3	283	972	4.8	FT-55
EFTA12-125	12	121.6	125	558	125	270	270	45.2	424	1225	4.0	FT-55
EFTA12-150	12	145.9	150	558	125	311	311	52.7	500	1400	4.0	FT-55
EFTA12-175	12	170.4	175	558	125	311	311	54.0	545	1527	3.3	FT-55
EFTA12-190	12	182.4	190	546	125	323.5	323.5	58.0	550	1538	4.1	FT-55
EFTA12-200	12	192.0	200	546	125	323.5	323.5	59.0	570	1550	4.0	FT-55

Technology

Principle of VRLA batteries

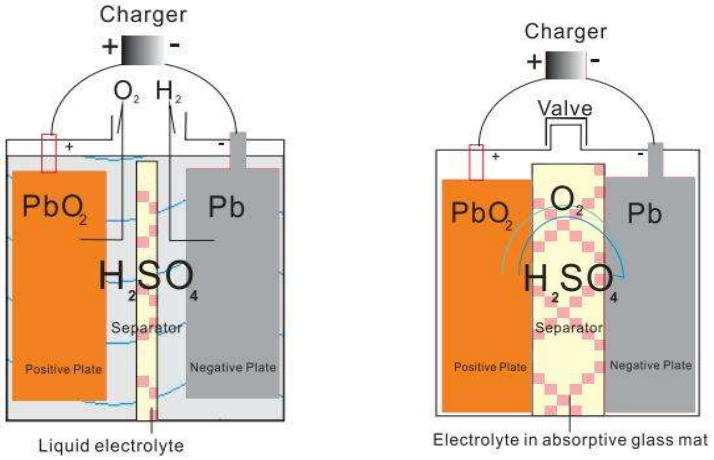
During charging of conventional lead acid battery, electrolyte is turned into water at the final stage and hydrogen generates from the negative plates and oxygen from the positive plates. This causes water loss and periodic watering is needed. However, evolution of oxygen and hydrogen gases does not occur simultaneously, because the recharge of the positive plates is not as efficient as the negative ones. This means that oxygen is evolved from the positive plate before hydrogen is evolved from the negative plate. At the same time, oxygen is evolved from the positive plate, a substantial amount of highly active spongy lead exists on the negative plate before it commences hydrogen evolution. Therefore, providing oxygen can be transported to the negative plates, conditions are ideal for a rapid reaction between lead and oxygen, for i.e., oxygen is electrochemically reduced on the negative plate according to the following formula, and the final product is water.

$$2e^{-}+2H^{+}+1/2O_2 \rightarrow H_2O$$

The current flowing through the negative plate drives this reaction instead of hydrogen evolution, which occurs, in a conventional battery.

This process is called gas recombination. If this process were 100% efficient no water would be lost from the battery. By careful design and selection of battery components, gas recombination efficiency is from 95% to 99%.

Principle of the oxygen reduction cycle follows:



Recombination efficiency

Recombination efficiency is tetermined under specific conditions by measuring the volume of bydrogen 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 batteries through the safety valve. The volume of gas emitted is very small and typical average values on constant potential float at 20℃ are as follow:

Float voltage (V)	Volume of gas emitted (ml/cell/C_{20}/month)
13.5～13.74	3.2
14.1～14.4	20.0

Performance Data

EFHP Series Discharge Current (Amperes @ 20℃)

Constant Current Discharge Data Sheet (20℃)------Amperes(A)															
Battery Type	End Voltage (V/cell)	Discharge Time													
		5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h	20 h
EFTB12-50	1.60	143.0	120.0	94.5	55.0	42.0	33.50	19.00	14.00	10.8	8.90	7.65	6.05	5.05	2.59
	1.65	133.0	109.0	89.0	53.0	40.5	32.50	18.80	13.70	10.6	8.70	7.60	6.00	5.04	2.57
	1.70	122.0	101.0	84.0	50.0	38.5	31.50	18.50	13.40	10.5	8.60	7.55	5.90	5.03	2.54
	1.75	111.0	93.0	77.5	48.0	37.0	30.50	18.30	13.10	10.3	8.50	7.45	5.84	5.02	2.50
	1.80	101.0	85.0	70.0	45.0	35.5	29.40	18.20	13.00	10.2	8.30	7.35	5.80	5.00	2.47
EFTB12-80	1.60	256.2	219.1	176.1	103.7	73.9	52.06	35.68	23.76	17.88	14.48	12.35	9.70	8.08	4.70
	1.65	237.7	203.0	163.6	97.5	71.5	50.80	35.23	23.31	17.69	14.39	12.16	9.65	8.06	4.57
	1.70	217.9	190.4	151.1	93.9	69.0	49.55	34.42	22.78	17.41	14.21	11.98	9.57	8.05	4.54
	1.75	198.7	173.5	139.5	89.4	66.3	48.35	34.07	22.50	17.13	13.94	11.90	9.52	8.03	4.50
	1.80	180.2	157.4	130.5	84.9	63.6	46.20	33.53	22.15	16.94	13.76	11.81	9.49	8.00	4.46
EFTB12-85	1.60	272.2	232.8	187.2	110.2	78.6	65.31	37.91	27.74	21.0	17.39	14.92	11.31	9.88	5.13
	1.65	252.6	215.7	173.9	103.6	76.0	63.98	37.43	27.27	20.8	17.29	14.82	11.26	9.79	5.04
	1.70	231.5	202.4	160.6	99.8	73.3	62.65	36.58	26.70	20.5	17.10	14.63	11.17	9.69	4.98
	1.75	211.1	184.3	148.2	95.0	70.4	61.37	36.20	26.41	20.2	16.82	14.44	11.12	9.60	4.93
	1.80	191.5	167.2	138.7	90.3	67.5	59.09	35.63	26.03	20.0	16.63	14.25	10.93	9.50	4.86
EFTB12-100	1.60	298.0	245.0	192.0	117.8	88.1	68.30	41.80	28.90	23.7	18.90	15.80	12.70	10.45	5.70
	1.65	286.0	228.0	180.0	112.6	83.3	67.40	41.40	28.40	23.5	18.56	15.80	12.60	10.35	5.65
	1.70	254.0	210.0	170.0	106.6	81.4	66.70	40.70	27.70	23.3	18.40	15.70	12.50	10.23	5.60
	1.75	228.0	198.0	148.0	102.4	79.2	64.20	40.30	27.40	23.3	18.13	15.70	12.40	10.10	5.55
	1.80	210.0	178.0	140.0	98.0	77.1	62.20	40.00	26.90	23.1	17.90	15.50	12.20	10.00	5.50
EFTB12-125	1.60	363.0	310.0	244.0	143.0	106.3	88.30	52.50	35.70	29.1	23.50	19.99	15.50	13.05	7.01
	1.65	334.0	285.0	226.0	136.0	103.8	84.80	51.30	34.60	28.6	23.30	19.96	15.40	12.85	6.94
	1.70	306.0	257.0	214.0	131.0	102.0	83.40	50.10	33.90	28.1	23.00	19.70	15.30	12.8	6.90
	1.75	280.0	231.0	189.0	126.0	99.3	80.50	49.50	33.50	27.6	22.70	19.65	15.10	12.70	6.87
	1.80	257.0	205.0	175.0	120.3	96.4	78.40	48.02	32.90	27.4	22.40	19.30	14.90	12.50	6.85
EFTB12-150	1.60	431.0	372.0	292.5	171.00	127.70	106.20	63.2	42.70	34.8	28.2	24.0	18.60	15.60	8.40
	1.65	400.0	341.0	271.0	163.50	124.50	101.80	61.8	41.50	34.6	27.8	24.0	18.50	15.40	8.30
	1.70	366.0	309.0	256.5	156.40	122.60	100.00	60.0	40.70	33.6	27.5	23.6	18.40	15.30	8.25
	1.75	334.0	277.0	226.0	151.50	119.20	96.30	59.3	40.20	33.1	27.2	23.4	18.20	15.20	8.20
	1.80	303.0	246.0	210.0	144.50	115.50	94.00	57.5	39.50	32.8	26.8	23.2	17.90	15.00	8.17

Performance Data

EFHP Series Discharge Current (Amperes @ 20℃)

Constant Current Discharge Data Sheet (20℃)------- Amperes(A)															
Battery Type	End Voltage (V/cell)	Discharge Time													
		5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h	20 h
EFTB12-155	1.60	445.4	384.4	302.3	176.7	132.0	109.74	65.31	44.12	36.0	29.14	24.82	19.22	16.12	8.68
	1.65	413.3	352.4	280.0	169.0	128.7	105.19	63.86	42.88	35.8	28.73	24.80	19.12	15.91	8.58
	1.70	378.2	319.3	265.1	161.6	126.7	103.33	62.00	42.06	34.7	28.42	24.39	19.01	15.81	8.53
	1.75	345.1	286.2	233.5	156.6	123.2	99.51	61.28	41.54	34.2	28.13	24.18	18.81	15.71	8.47
	1.80	313.1	254.2	217.0	149.3	119.4	97.13	59.42	40.82	33.9	27.69	23.93	18.50	15.50	8.44
EFTA12-100	1.60	276.3	221.0	182.6	125.2	87.3	66.5	39.7	28.64	23.4	18.88	16.08	12.48	10.48	5.63
	1.65	258.2	202.4	173.1	117.3	80.2	62.9	38.8	27.84	23.0	18.64	16.08	12.40	10.32	5.58
	1.70	237.3	182.1	159.6	109.4	74.4	57.3	37.8	27.28	22.6	18.48	15.84	12.32	10.32	5.54
	1.75	218.7	166.9	150.0	104.9	72.5	55.9	37.2	26.96	22.2	18.24	15.68	12.16	10.16	5.52
	1.80	195.1	155.1	138.1	96.4	65.1	51.8	36.2	26.48	22.0	18.00	15.52	12.00	10.0	5.50
EFTA12-125	1.60	361.0	312.0	245.0	144.0	107.0	88.9	52.9	35.80	29.2	23.60	20.10	15.60	13.10	7.04
	1.65	335.0	286.0	227.0	137.0	104.5	85.3	51.8	34.80	28.7	23.30	20.10	15.50	12.9	6.97
	1.70	307.0	259.0	215.0	131.0	102.7	83.8	50.3	34.10	28.2	23.10	19.80	15.40	12.9	6.93
	1.75	280.0	232.0	190.0	127.0	99.8	80.7	49.7	33.70	27.7	22.80	19.60	15.20	12.70	6.90
	1.80	254.0	206.0	176.0	121.0	96.8	78.8	48.2	33.10	27.5	22.50	19.40	15.00	12.5	6.88
EFTA12-150	1.60	414.4	331.5	273.9	187.7	130.9	99.7	59.6	42.96	35.0	28.32	24.12	18.72	15.72	8.45
	1.65	387.2	303.6	259.7	175.9	120.3	94.4	58.2	41.76	34.4	27.96	24.12	18.60	15.48	8.36
	1.70	356.0	273.2	239.4	164.1	111.5	86.0	56.7	40.92	33.8	27.72	23.76	18.48	15.48	8.32
	1.75	328.1	250.3	225.0	157.3	108.8	83.8	55.8	40.44	33.2	27.36	23.52	18.24	15.24	8.28
	1.80	292.7	232.6	207.2	144.6	97.7	77.6	54.2	39.72	33.0	27.00	23.28	18.00	15.0	8.26
EFTA12-175	1.60	490.0	392.0	324.0	222.0	167.0	131	74.1	50.10	40.9	33.00	28.10	21.90	18.40	9.90
	1.65	458.0	359.0	307.0	208.0	158.0	124	72.5	48.70	40.2	32.60	28.10	21.80	18.2	9.80
	1.70	421.0	323.0	283.0	194.0	145.0	113	70.5	47.80	39.5	32.30	27.70	21.50	18	9.70
	1.75	388.0	296.0	266.0	186.0	136.0	110	69.5	47.20	38.8	31.90	27.40	21.30	17.90	9.65
	1.80	346.0	275.0	245.0	171.0	129.0	102.0	67.5	46.40	38.5	31.50	27.10	21.00	17.5	9.60
EFTA12-190	1.60	524.9	419.9	347.0	237.8	174.5	140.3	79.4	53.70	43.8	35.30	30.10	23.40	19.60	10.60
	1.65	490.5	384.6	328.9	222.8	160.4	132.8	77.6	52.10	43.1	34.90	30.10	23.30	19.4	10.50
	1.70	450.9	346.0	303.2	207.9	148.7	121	75.6	51.20	42.3	34.60	29.70	23.00	19.3	10.30
	1.75	415.6	317.1	285.0	199.3	145.0	117.9	74.4	50.60	41.6	34.20	29.40	22.80	19.10	10.25
	1.80	370.7	294.6	262.4	183.2	130.2	109.3	72.3	49.70	41.3	33.80	29.10	22.50	19.0	10.20
EFTA12-200	1.60	552.5	442.0	365.3	250.3	174.5	132.9	79.4	54.8	44.8	37.2	31.7	24.6	20.6	11.2
	1.65	516.3	404.8	346.2	234.5	160.4	125.8	77.6	53.2	44.1	36.7	31.7	24.5	20.4	11.1
	1.70	474.6	364.2	319.2	218.8	148.7	114.6	75.6	52.3	43.3	36.4	31.3	24.2	20.3	10.8
	1.75	437.5	333.8	300.0	209.8	145.0	111.7	74.4	51.7	42.6	36.0	30.9	24.0	20.1	10.8
	1.80	390.2	310.1	276.2	192.8	130.2	103.5	72.3	50.7	42.2	35.6	30.6	23.7	20.0	10.7

Performance Data

EFHP Series Discharge Power (Watts @ 20℃)

Constant Power Discharge Data Sheet (20℃)-------Watt (W)															
Battery Type	End Voltage (V/cell)	Discharge Time													
		5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h	20 h
EFTB12-50	1.60	235.0	203.00	165.10	105.60	78.10	63.3	37.10	27.50	21.40	17.20	15.0	11.60	10.30	4.92
	1.65	226.0	190.00	159.80	102.50	76.9	61.4	35.90	27.20	21.10	16.9	14.8	11.40	10.20	4.86
	1.70	213.0	183.00	153.00	100.00	75	60.8	35.40	26.80	20.80	16.7	14.7	11.40	10.10	4.79
	1.75	204.0	172.00	147.00	96.90	73.80	58.9	34.90	26.30	20.40	16.52	15.6	11.30	10.10	4.72
	1.80	193.0	164.00	136.00	93.80	71.90	57.0	34.30	25.90	20.10	16.36	15.3	11.20	10.00	4.67
EFTB12-80	1.60	407.8	357.2	299.1	187.5	139.5	108.61	67.506	49.62	37.821	31.29	27.00	20.30	17.88	9.25
	1.65	399.5	339.3	281.2	178.6	135.0	106.82	66.969	49.00	37.553	31.20	26.82	20.25	17.525	9.21
	1.70	370.2	326.8	266.0	172.3	131.4	105.04	66.075	48.28	37.374	31.03	26.56	20.19	16.988	9.16
	1.75	348.2	305.3	252.6	164.3	127.0	101	65.718	47.84	37.106	30.76	26.38	20.12	16.63	9.11
	1.80	323.4	286.5	237.4	157.1	122.5	98	64.9	47.48	36.838	30.49	26.20	20.03	16.1	9.05
EFTB12-85	1.60	433.3	379.5	317.8	199.3	148.2	115.4	71.73	52.73	40.19	33.25	28.69	21.57	19.00	9.82
	1.65	424.5	360.5	298.8	189.8	143.5	113.5	71.16	52.06	39.90	33.16	28.50	21.52	18.62	9.79
	1.70	393.4	347.2	282.6	183.1	139.7	111.6	70.21	51.30	39.71	32.97	28.22	21.45	18.05	9.73
	1.75	370.0	324.4	268.4	174.6	134.9	107.8	69.83	50.83	39.43	32.68	28.03	21.38	17.67	9.68
	1.80	343.6	304.5	252.2	167.0	130.2	104.0	68.97	50.45	39.14	32.40	27.84	21.28	17.1	9.61
EFTB12-100	1.60	470.0	415.0	336.3	217.3	160.9	132.0	77.1	55.5	42.5	36.5	30.7	23.0	20.2	10.40
	1.65	450.0	399.0	327.5	207.0	156.4	130.0	74.8	54.8	42.2	35.9	30.5	22.9	20.1	10.35
	1.70	437.0	380.0	312.0	202.0	150.5	128.0	73.6	54.0	42	35.1	30.2	22.8	20	10.30
	1.75	415.0	362.0	299.0	193.8	145.9	124.0	72.5	53.5	41.7	34.7	30.0	22.7	19.8	10.25
	1.80	399.0	345.0	285.0	187.5	142.1	120.0	71.4	53.1	41.4	34.1	29.6	22.6	19.7	10.20
EFTB12-125	1.60	584.0	513.0	421.0	257.0	205.0	164	94.9	65.70	53.7	44.20	37.80	28.70	25.10	12.96
	1.65	559.0	489.0	404.0	249.0	199.0	154	93.3	64.60	53	44.00	37.50	28.60	25.06	12.94
	1.70	531.0	471.0	391.0	243.0	194.0	153	92.8	64.00	52.5	43.80	37.30	28.50	25.03	12.92
	1.75	501.0	441.0	349.0	235.0	187.0	149	91.6	63.00	52	43.20	37.00	28.40	25.00	12.90
	1.80	466.0	415.0	322.0	227.0	180.0	145.0	90.0	62.00	51.7	42.90	36.80	28.20	24.8	12.85
EFTB12-150	1.60	708.8	580.3	493.0	313.2	246.0	187.75	113.65	78.91	63.754	53.01	45.28	34.34	29.92	15.56
	1.65	677.7	547.2	477.9	306.2	239.0	182.73	112.75	77.61	63.353	52.71	44.98	34.24	29.87	15.51
	1.70	644.6	510.0	451.8	296.2	231.9	175.7	111.34	76.81	63.051	52.51	44.68	34.14	29.82	15.46
	1.75	607.4	478.9	433.7	289.2	223.9	171.68	110.64	75.60	62.449	51.81	44.38	33.94	29.72	15.41
	1.80	565.3	461.8	416.7	280.1	215.9	165.7	109.2	74.50	62.047	51.40	43.98	33.73	29.62	15.36

Performance Data

EFHP Series Discharge Power (Watts @ 20℃)

Constant Power Discharge Data Sheet (20℃)-------Watt (W)															
Battery Type	End Voltage (V/cell)	Discharge Time													
		5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h	20 h
EFTB12-155	1.60	732.5	599.7	509.4	323.7	254.2	194.01	117.44	81.55	65.879	54.78	46.79	35.48	30.92	16.08
	1.65	700.3	565.4	493.8	316.4	246.9	188.82	116.51	80.20	65.464	54.47	46.48	35.38	30.86	16.03
	1.70	666.1	527.0	466.9	306.1	239.7	181.56	115.06	79.37	65.153	54.26	46.17	35.27	30.81	15.98
	1.75	627.7	494.9	448.2	298.8	231.4	177.41	114.33	78.12	64.531	53.53	45.86	35.07	30.71	15.93
	1.80	584.1	477.2	430.5	289.5	223.1	171.2	112.9	76.98	64.116	53.12	45.44	34.86	30.61	15.87
EFTA12-100	1.60	470.4	416.8	342.4	214.4	178.4	134.4	80.0	54.40	44.64	36.00	30.88	24.00	20.16	10.88
	1.65	450.4	393.6	323.2	206.4	173.6	129.6	78.64	53.20	44.16	35.84	30.80	23.84	20.13	10.84
	1.70	428.0	366.4	313.6	198.4	168.8	128	77.36	52.40	43.52	35.68	30.64	23.76	20.10	10.80
	1.75	403.2	338.4	286.4	192.0	166.4	124	76.64	51.84	43.04	35.44	30.40	23.60	20.00	10.76
	1.80	375.2	310.4	265.6	184.0	161.6	121.6	74.6	51.44	42.8	35.12	30.24	23.44	19.76	10.71
EFTA12-125	1.60	588.0	521.0	428.0	268.0	223.0	168	100.0	68.00	55.8	45.00	38.60	30.00	25.20	13.60
	1.65	563.0	492.0	404.0	258.0	217.0	162	98.3	66.50	55.2	44.80	38.50	29.80	25.16	13.55
	1.70	535.0	458.0	392.0	248.0	211.0	160	96.7	65.50	54.4	44.60	38.30	29.70	25.12	13.50
	1.75	504.0	423.0	358.0	240.0	208.0	155	95.8	64.80	53.8	44.30	38.00	29.50	25.00	13.45
	1.80	469.0	388.0	332.0	230.0	202.0	152.0	93.3	64.30	53.5	43.90	37.80	29.30	24.7	13.39
EFTA12-150	1.60	706.0	568.0	491.0	322.0	268.0	213	120.0	81.60	67	54.00	46.30	36.00	30.50	16.30
	1.65	675.0	535.0	476.0	310.0	260.0	210	118.0	79.80	66.2	53.70	46.20	35.80	30.5	16.27
	1.70	642.0	498.0	450.0	302.0	253.0	205	116.0	78.60	65.3	53.50	45.90	35.60	30.2	16.23
	1.75	605.0	467.0	432.0	293.0	250.0	202	115.0	77.80	64.5	53.10	45.60	35.40	30.20	16.20
	1.80	563.0	450.0	415.0	284.0	242.0	196.0	112.0	77.10	64.2	52.70	45.30	35.10	29.6	16.15
EFTA12-175	1.60	824.0	663.0	548.0	376.0	313.0	245.0	140.0	95.20	78.2	63.00	54.00	42.00	35.60	19.00
	1.65	788.0	624.0	535.0	362.0	303.0	241.5	138.0	93.10	77.2	62.70	53.90	41.80	35.45	18.97
	1.70	749.0	581.0	509.0	352.0	295.0	235.8	135.0	91.70	76.2	62.40	53.60	41.50	35.32	18.94
	1.75	706.0	545.0	490.0	342.0	292.0	232.3	134.0	90.80	75.3	62.00	53.20	41.30	35.20	18.90
	1.80	657.0	525.0	468.0	329.0	282.0	225.4	131.0	90.00	74.9	61.40	52.90	41.00	34.5	18.86
EFTB12-190	1.60	882.6	710.2	570.0	452.5	335.2	262.1	150.0	110.0	83.8	67.50	57.90	44.90	32.65	20.40
	1.65	844.0	668.4	550.0	437.3	324.6	258.4	147.8	107.0	82.7	67.20	57.70	44.70	32.5	20.30
	1.70	802.2	622.3	520.0	418.0	316.0	252.3	144.6	104.0	81.6	66.90	57.40	44.40	32.2	20.10
	1.75	756.3	583.7	483.0	397.0	312.8	248.6	143.6	103.0	80.7	66.40	57.00	44.20	32.00	19.90
	1.80	703.7	562.3	473.0	387.0	302.1	241.2	140.3	100.0	80.3	65.70	56.60	43.90	31.8	19.80
EFTA12-200	1.60	838.5	674.7	541.5	429.9	302.5	214.6	135.4	99.3	75.6	60.9	52.3	40.5	29.5	18.4
	1.65	801.8	635.0	522.5	415.4	293.0	208.8	133.4	96.6	74.6	60.6	52.1	40.3	29.3	18.3
	1.70	762.1	591.2	494.0	397.1	285.2	199.2	130.5	93.9	73.6	60.4	51.8	40.1	29.1	18.1
	1.75	718.5	554.5	458.9	377.2	282.3	195.3	129.6	93.0	72.8	59.9	51.4	39.9	28.9	18.0
	1.80	668.5	534.2	449.4	367.7	272.6	188.5	126.6	90.3	72.5	59.3	51.1	39.6	28.7	17.9

Selection of Battery Size

The following examples are designed to illustrate the Method of determining which **ABT** Enduro EFHPFront Terminal unit will support your required duty load.

Constant current discharge

EXAMPLE A.To demonstrate constant current Calculation and also the effect of temperature.

A nominal 48V telecommunications system using a 24 cell battery and requiring 17.5 amps constant current will operate satisfactorily at a minimum battery terminal volts level of 42 volts.

Calculate the battery type required for 5hours

Standby duration on the basis of:

(a) 20℃ operating temperature

(b) 0℃ operating temperature

METHOD

(1) Minimum allowable volts per cell

$$\frac{42 \text{ volts}}{24 \text{ cells}} = 1.75\text{Vpc}$$

(2) Hence,cell performance requirement is 17.5 Amps Constant current to1.75Vpc

(3) By reference to constant current performance Table relating to1.75 volts per cell level (see page 6):

(a) At 20℃

EFTA12-100 or EFTB12-100 unit size is smallest Available size to use (18.9 and 18.7 amps available).

Conclusion: Use 4-EFTA12-100 or EFTB12-100

(b) At 0℃

By reference to the table on page11 of this Product technology, available current output at 20℃ is reduced by factor 0.83.

Hence EFTA12-100X unit size too small!

Try the next largest unit size-EFTA12-125 or EFTB12-125. At 0℃ available current output is 23.5 ampsx0.83=19.5amps.

Conclusion:Use 4-EFTA12-125 or EFTB12-125

Constant power discharge

EXAMPLE B. To demonstrate constant power calculation.

An inverter system requires a D.C. constant power input of 5.8kW in the voltage range 451 volts maximum,317volts minimum.

Calculate the optimum battery size required for operation for a 4 hour standby period.

METHOD

(1) Number of cells

=451/2.27Vpc=199cells.

(2) Minimum volt per cell

317/199=1.6Vpc.

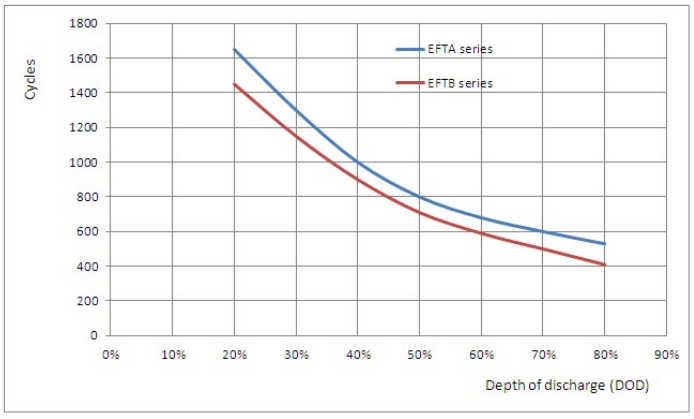
(3) Watts per cell

=5800watts/199cells=29.1watts per cell.

(4) Hence cell performance requirement is 29.1

Watts to1.6Vpc at 20℃.

Cycle life vs depth of discharge



Operating Characteristics

The **Enduro EFHP** Front Terminal units should be charged using constant potential chargers.

Float Voltage

At normal room temperature (20℃), the recommended float voltage is equal to 2.27volts per cell.

To optimise battery performance it is recommended that the float voltage is adjusted for room ambient temperatures in accordance with the following table.

Temperature	Float Voltage (V/cell)
0℃	2.34
10℃	2.31
20℃	2.27
25℃	2.25
30℃	2.24
35℃	2.22

Under these conditions are charge will be completed in approximately 72 hours.

Charging current

A discharged VRLA battery will accept a high recharge current,but for those seeking a more economical charging system a current limit of $0.2C_{10}$ (A) is adequate.

Note: For a completely discharged battery, 80% of the capacity is replaced in approximately:

- 10 hours at $0.1C_{10}$
- 6 hours at $0.2C_{10}$
- 5 hours no current limit applied

Fast Charge

Increasing the charge voltage to14.1~14.4volts per battery can reduce recharge time and it is possible, depending on the depth of discharge, to halve the recharge time. Under these conditions, however, the charge must be monitored and must bet erminated when the charge current remains reasonably steady for 3 consecutive hours after the voltage limit has been reached. At the beginning of charge the current must be limited to $0.2C_{10}$(A). This charge regime, in order to achieve a normal service life, must not be used more than once per month.

The effect of temperature onc apacity

Temperature affects capacity of batteries. Correction factors for capacity at different temperatures are shown in the following table,

Duration of discharge	Battery temperature								
	0℃	5℃	10℃	15℃	20℃	25℃	30℃	35℃	40℃
15min	0.65	0.71	0.78	0.85	1.00	1.04	1.07	1.15	1.22
1 hour	0.74	0.80	0.85	0.90	1.00	1.03	1.05	1.09	1.14
10 hour	0.82	0.86	0.90	0.95	1.00	1.02	1.04	1.06	1.08

the reference temperature being 20℃

.

Operating Instructions and Guidelines

Accidental deep discharge

e.g.

(1) Discharge at a lower current for a longer time than the original system specification.

(2) Failure of the charging system.

(3)Battery not recharged immediately after a discharge.

When a battery is completely discharged:

(1) The utilisation of the sulphuric acid in the electrolyte is total and the electrolyte now consists only of water. During recharge this condition may produce metallic dendrites which can penetrate the separator and cause a short circuit in a cell.

(2) The sulphation of the plate is at its maximum and the internal resistance of the cell is also at its maximum.

The battery should be recharged under a constant potential of 2.27volts per cell with the current limited to a maximum of $0.2C_{10}$(A) in order to prevent excessive internal heating. For instance, for a Enduro EFTB12-125 the maximum charge current is 25 amps. If the sulphation of the cell/battery is extensive, then there charge of the battery may require more than 96 hours.

Note: Deep discharging will produce a premature deterioration of the battery and a noticeable reduction in the life expectency of the battery.

For optimum operation the minimum voltage of the system should be related to the duty as follows:

Discharge current (A)	Final discharge voltage (V/cell)
$I \leqslant 0.25C_{10}$	1.80
$0.25C_{10} < I \leqslant 0.55C_{10}$	1.75
$055C_{10} < I \leqslant 1.0C_{10}$	1.60
$1.0C_{10} < I$	1.55

In order to protect the battery it is advisable to have system monitoring and low voltage cut-out.

Float charge ripple

Excessive ripple on the D.C. supply across a battery
has the effect of reducing life and performance.
It is recommended therefore, that voltage regulation across the system including the load, but without the battery connected, under steady state conditions, shall be better than 1% between

Transient and other ripple type excursions can be accommodated provided that, with the battery disconnected, but the load connected, the system peak to peak voltage including the regulation limits, falls within 2.5% of the recommended float voltage of the battery.

Under no circum stances should the current flowing through the battery when it is operating under float conditions, reverse into the discharge mode.

Electro-Magnetic Compatibility (EMC)

Products are covered by the EMC statement in EN50226 which reads as follows:

Rechargeable cells or batteries are not sensitive to normal electromagnetic disturbances, and

Therefore no immunity tests shall be required. Free-standing rechargeable cells or batteries electrically isolated from any associated electrical system are for all practical purpose selectromagnetically inert, and therefore the requirements for electromagnetic compatibility shall be deemed to be satisfied.

Note: It should be noted that rechargeable cells or batteries are part of an electrical system, and the manner in which they are used could invoke the requirements of the electromagnetic compatibility upon that system. In such cases, the requirements of electromagnetic compatibility shall be accommodated by the design of the system.

Maintenance

- Every month, check that the total voltage at the battery terminals is (Nx2.27V) for a temperature of 20℃.
  N= the number of cells in the battery
- Once a year, take a reading of the individual bloc voltages in the battery. Avariation of 4.5% on individual voltages from the average voltage is acceptable.
- The system must be checked once or twice a year.
- New and old batteries cannot be used together.

The batteries of various specifications and from different manufacturers cannot be used together.

Principal factors affecting the life of recombination batteries

- Deep discharge
- Poor control of the float voltage
- Cycling or micro-cycling
- Poor quality of charging current (excessive ripple)
- High ambient temperature
- Overcharge

Installation, Commissioning and Maintenance

Waring

ABT Enduro EFHP Front Terminal units are already charged when delivered.

They should be unpacked with care. Avoid short circuiting terminals of opposite polarity as these units are capable of discharging at a very high current, especially if the lid or the container is damaged.

Unpacking

It is advisable to unpack all the monoblocs and accessories before commencing to erect and not to unpack and erect monoblocs by monoblocs.

All items should be carefully checked against the accompanying advice notes to ascertain if any are missing. Advise the Sales Department of any discrepancies.

A rigid plastic insulating cover is provided which totally protects the unit terminals. This is factory fitted to all products of the range and there is no need to remove it until access to the terminals is required.

Seting up the battery stands

The structure should be assembled in accordance with instructions supplied with the equipment.
To level the stand use the adjustable insulating feet.

Mounting in a cabinet

Ensure that the cabinet:

- Is sufficiently strong to cope with the weight of the battery.
- Is suitably insulated.
- Is naturally ventilated.

Connecting the monoblocs:

- Torque setting

Tighten the nuts or bolts to the recommended levelsoftorqueindicatedontheproductlabel.
Alwaysuseinsulatedtoolsforfittingandtorquing upbatteryconnections.

- **In series**

The number of cells in series (N) will not affect the
selected float voltage
Therefore, charging float voltage
=N x Cell float voltage
No special circuit arrangements are required.

- **In parallel**

Using constant voltage chargers, and ensuring that the connections made between the charger and the batteries have the same electrical resistance,no special arrangements have to be made for batteries in parallel.
Although no specialc ircuit arrangements are required, where the parallel connection is made at the charger or distribution board, to avoid out of step conditions, the busbar run length and the area of cross section should be designed so that the circuit resistance value for each string is equal within limits ±5%

General recommendations

- Do not wear clothing of synthetic material to avoid static generation.
- Use only a clean soft damp cloth for cleaning them on oblocs. Do not use chemicals or detergents
- Use insulated tolls
- Commence installation at the least accessible point.
- Consult the drawing for the correct position of the monoblocs poles.

Commissioning charge

Ensure that the batteries will be operated in a clean environment.
Before use, the batteries should be charged at a constant float voltage adjusted according to the ambient temperature, e.g.13.50~13.74V/battery at 20℃ for 48 to 96 hours oralternatively, a voltage of 14.4-14.7V/battery at 20℃ can be used to reduce the commissioning period from 24 to 15-20 hours.
Where the batteries have been stored under harsh conditions, this increased voltage recharge is particularly effective.

Battery Storage

Storage conditions

The battery should store in a dry, clean, ventilated and preferably cool location. Avoid placing batteries in close proximity to heat sources of any kind.

Storage time

As the batteries are supplied charged, storage time is limited. In order to easily charge the batteries after prolonged storage, it is advisable not to store batteries for more than:

- 6 months at 20℃
- 3 months at 30℃
- 6 weeks at 40℃

Battery state of charge

The battery state of charge can be determined by measuring the open-circuit voltage of cells in rest position for 24 hours at 20℃.

State of charge	The open-circuit voltage (V/cell)
100%	≥2.15
80%	≥2.12
60%	≥2.07
40%	≥2.04
20%	≥2.00

Recharge of stored batteries

A refreshing charge shall be performed after this time at 13.5-13.74V/battery at 20℃ for 48 to 96 hours. A current limit is not essential, but for optimum charge efficiency the current output of the charger can be limited to 20% of the 10-hour rated capacity.

The necessity of a refreshing charge can also be determined by measuring the open circuit voltage of a stored battery. Refreshing charge is advised if the voltage drops below 2.10 volts per cell.

Failure to observe these conditions may resulting reatly reduced capacity and service life.

ABT VRLA Battery:

PowerLine/Thunder/Enduro/Sunwind/e-Trek/Gel

ABT World Wide

Our sales growth is due to a complete Global Network with Master distributors and Country managers who apply ABT commercial strategy and through Global Key Account, in

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