ABT®
Advanced Battery Technology

VALVE-REGULATED
SEALED LEAD
ACID BATTERY

Enduro
TFT Series

Dual High Rate Performance
Front Terminal Battery

Product Guide

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Introduction

The ABT Enduro TFT VRLA batteries are designed for dual purpose of Telecom and UPS in floating and high rate discharge backup system with proven compliance to the most rigorous international standards.
Euduro TFT is also recognized as long service life and higher performance batteries. The Enduro TFT front terminal monoblocs is compact design and standard footprint for 19" and 23" and ETSI racking.

- pb_Ca_Sn alloy grids designed to resist corrosion for longer life
- Low resistance microporous glass fibre separator
- 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 a bolt and stainless nut and washers
- Design life 10 years
- Low Self Discharge
- U.L.Component Recognition

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 TFT 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**

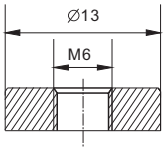
  All ABT Enduro TFT batteries are equipped with safety release valves , designated to operate between 1.4 and 5 psi and automatically close . Hence there is never an excessive accumulation of gas within the battery .

- **Maintenance Free Operation**

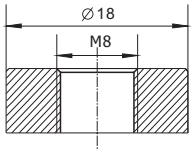
  There is no need to check specific gravity of the electrolyte or add water to ABT Enduro TFT batteries during float service life.

- **Terminals**

  Front terminals M6 and M8 thread inserted for easy installation and maintenance.



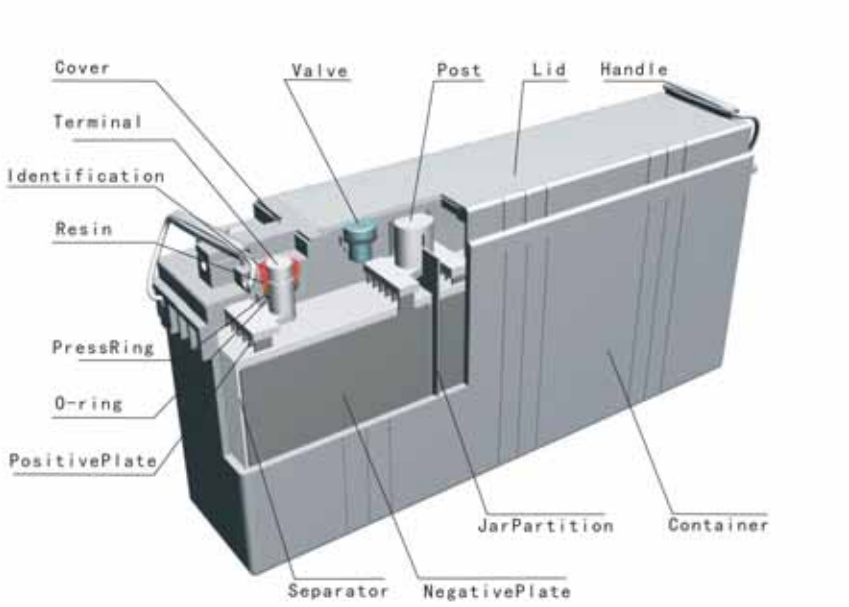
M6XΦ13



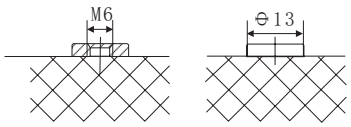
M8XΦ18

Construction

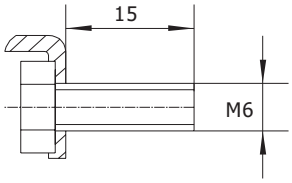
The construction and sealing technique of the ABT Enduro TFT batteries guarantee leakage proof with no adverse effect to capacity or service life.



TFT12-55

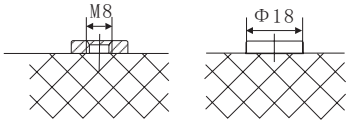


TFT12-90/95

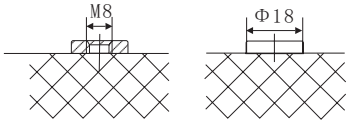


Gas collector System has been designed to collect and disperse gas evolved during normal battery operation where required.

TFT12-105



TFT12-130/160/170



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 10 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 in system design and location

Discharge -20~60°C;

Charge -10~60°C;

Storage -20~60°Ci

Deep Discharge Recovery

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

Complying Standards

- IEC60896-21 2004
- IEC60896-22 2004
- JIS C8702-1 2003
- JIS C8702-2 2003
- JIS C8704-1 2006
- JIS C8704-2 2006
- BS6290-4 1997
- Eurobat Guide
- IEC 707 FV0

Certification

- CE
- UL
- GOST
- ISO9001
- ISO14001
- OHSAS18001

General Specifications

Battery Type	Nominal Voltage (V)	Nominal Capacity (20°C)		Length	Width	Height	Overall Height with Poles	Weight	Maximum Current (20°C)		Internal Impedance (20°C)	Terminal Types
		C_8(Ah) 1.75Vpc	C_{10}(Ah) 1.80Vpc	mm	mm	mm	mm	kg	In 1 min (A)	In 1 sec (A)	mOhm	
TFT12-55	12	49.6	55	277	105	260	260	17.7	150	800	800	M6XΦ13
TFT12-90	12	80.8	88	395	105	270	270	28.2	200	1000	1000	M8XΦ18
TFT12-95	12	88.8	92	395	105	270	270	28.5	260	1100	1100	M8XΦ18
TFT12-105	12	100	105	508	110	238	238	33.4	260	1100	1100	M8XΦ18
TFT12-130	12	124	130	551	110	320	320	45.8	200	1000	1000	M8XΦ18
TFT12-160	12	147.2	160	551	110	320	320	51.2	300	1150	1150	M8XΦ18
TFT12-170	12	152	165	551	110	320	320	51.2	300	1150	1150	M8XΦ18

*All with rope handles

Performance Data

Constant Current Discharge performance

Amperes

Constant Current Discharge (Amperes) at 20°C to 1.60 volts per cell																							
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	176.0	135.0	114.0	98.5	83.0	67.5	63.1	58.6	54.2	47.9	35.5	28.2	20.9	17.8	14.6	11.6	9.50	8.06	7.2	6.40	6.0	5.65	4.90	2.50
TFT12-90	286.0	198.7	163.2	141.0	118.9	96.7	89.3	81.9	74.5	68.6	57.0	44.6	32.3	27.9	23.8	19.0	15.7	13.0	11.5	10.4	9.44	8.90	7.34	4.00
TFT12-95	294.0	211.0	176.0	152.3	128.7	105.0	95.3	85.7	76.0	70.7	60.0	47.6	35.1	30.3	25.5	20.7	17.6	14.4	12.8	11.2	10.3	9.30	7.95	4.05
TFT12-105	334.0	258.0	225.0	191.0	157.0	123.0	110.8	98.7	86.5	80.0	67.0	53.0	39.0	33.9	28.8	23.7	20.0	16.3	14.5	12.6	11.7	10.7	7.90	4.65
TFT12-130	409.0	298.2	248.7	215.3	181.8	148.4	134.7	121.1	107.4	99.9	84.8	67.2	49.6	42.8	36.0	29.3	24.8	20.3	18.1	15.8	14.5	13.1	11.2	5.72
TFT12-160	509.0	350.0	282.8	244.4	206.0	167.6	154.8	141.9	131.8	122.8	106.1	83.2	60.2	50.9	42.6	33.4	27.5	22.8	20.3	18.9	17.2	16.1	13.7	7.44
TFT12-170	526.0	371.8	291.7	252.1	212.5	172.9	159.6	146.3	135.9	126.6	109.4	85.8	62.1	52.5	43.9	34.4	28.4	23.5	20.9	19.5	17.8	16.6	14.1	7.68

Constant Current Discharge (Amperes) at 20°C to 1.65 volts per cell																							
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	164.0	130.0	108.0	93.7	79.3	65.0	60.4	55.9	51.3	45.7	34.6	27.7	20.7	17.6	14.4	11.5	9.45	8.01	7.2	6.35	6.0	5.60	4.90	2.48
TFT12-90	259.0	191.4	156.4	135.3	114.2	93.2	85.6	78.1	70.6	65.7	56.1	44.0	32.0	27.6	23.5	18.9	15.6	13.0	11.5	10.4	9.44	8.90	7.31	4.00
TFT12-95	274.0	194.0	165.0	144.0	123.0	102.0	92.2	82.3	72.5	67.8	58.5	46.5	34.5	29.8	25.2	20.5	17.5	14.4	12.8	11.2	10.3	9.30	7.93	4.04
TFT12-105	311.0	240.0	210.0	179.3	148.7	118.0	106.2	94.3	82.5	76.8	65.4	52.0	38.5	33.4	28.3	23.2	19.8	16.3	14.5	12.6	11.6	10.6	7.90	4.64
TFT12-130	384.0	274.1	233.2	203.5	173.8	144.1	130.2	116.3	102.4	95.9	82.7	65.7	48.8	42.2	35.6	29.0	24.7	20.3	18.1	15.8	14.5	13.1	11.2	5.71
TFT12-160	474.0	336.0	271.1	234.5	198.0	161.5	148.4	135.3	124.9	117.6	104.5	82.1	59.6	50.4	42.0	33.1	27.4	22.8	20.3	18.9	17.2	16.1	13.6	7.44
TFT12-170	489.5	356.9	279.5	241.8	204.2	166.5	153.0	139.6	128.8	121.3	107.8	84.6	61.4	52.0	43.3	34.1	28.3	23.5	20.9	19.5	17.8	16.6	14.0	7.68

Constant Current Discharge (Amperes) at 20°C to 1.70 volts per cell																							
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	151.0	125.0	102.0	88.8	75.7	62.5	57.8	53.1	48.5	43.6	34.0	27.3	20.5	17.4	14.2	11.4	9.40	7.95	7.1	6.30	5.9	5.56	4.85	2.48
TFT12-90	244.0	184.0	144.5	129.9	110.3	90.6	83.4	76.2	69.0	64.3	54.7	43.1	31.5	27.2	23.3	18.7	15.6	12.9	11.4	10.1	9.35	8.90	7.31	3.96
TFT12-95	252.0	178.0	154.0	135.3	116.7	98.0	88.7	79.5	70.2	65.8	57.0	45.4	33.8	29.3	24.8	20.3	17.3	14.3	12.7	11.1	10.2	9.20	7.92	4.03
TFT12-105	287.0	219.0	200.0	171.0	142.0	113.0	101.3	89.7	78.0	73.3	64.0	51.1	38.2	33.0	27.8	22.6	19.4	16.2	14.4	12.6	11.6	10.6	7.90	4.63
TFT12-130	353.0	251.5	217.6	191.2	164.9	138.5	125.4	112.3	99.2	93.0	80.5	64.2	47.8	41.4	35.0	28.7	24.4	20.2	17.9	15.7	14.3	13.0	11.2	5.69
TFT12-160	435.0	320.0	250.4	225.2	191.1	157.0	144.6	132.1	122.2	115.0	102.0	80.3	58.6	49.7	41.7	32.8	27.2	22.6	20.2	18.5	17.1	16.1	13.6	7.38
TFT12-170	451.0	339.9	258.3	232.2	197.1	161.9	149.1	136.2	126.0	118.6	105.2	82.8	60.4	51.2	43.0	33.8	28.1	23.3	20.8	19.1	17.6	16.6	14.0	7.61

Performance Data

Constant Current Discharge performance

Amperes

Constant Current Discharge (Amperes) at 20°C to 1.75 volts per cell																								
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	132.0	120.0	98.0	85.3	72.7	60.0	55.5	51.0	46.6	42.1	33.2	26.8	20.3	17.2	14.0	11.3	9.36	7.80	7.0	6.20	5.9	5.53	4.85	2.45
TFT12-90	215.0	176.6	138.0	124.2	105.6	87.0	80.4	73.8	67.2	62.7	53.7	42.4	31.1	27.0	23.3	18.7	15.5	12.9	11.3	10.1	9.35	8.80	7.28	3.94
TFT12-95	221.0	168.0	143.0	126.3	109.7	93.0	84.9	76.7	68.6	64.3	55.6	44.4	33.2	28.8	24.5	20.1	17.2	14.2	12.7	11.1	10.2	9.20	7.92	4.02
TFT12-105	249.0	202.0	190.0	162.7	135.3	108.0	96.9	85.7	74.6	70.6	62.6	50.3	38.0	32.7	27.5	22.2	19.2	16.2	14.4	12.5	11.6	10.6	7.90	4.62
TFT12-130	307.0	237.4	202.1	178.5	155.0	131.4	119.9	108.4	96.9	90.8	78.6	62.7	46.9	40.7	34.6	28.4	24.2	20.1	17.9	15.5	14.3	13.0	11.2	5.68
TFT12-160	381.5	306.0	241.0	215.3	183.1	150.8	139.4	127.9	118.9	112.1	100.1	79.0	58.0	49.3	41.7	32.8	27.1	22.6	20.0	18.4	17.1	16.0	13.6	7.35
TFT12-170	394.0	325.0	248.5	222.0	188.8	155.6	143.7	131.9	122.6	115.6	103.2	81.5	59.8	50.8	43.0	33.8	27.9	23.3	20.6	19.0	17.6	16.5	14.0	7.58

Constant Current Discharge (Amperes) at 20°C to 1.80 volts per cell																								
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	118.0	115.0	94.0	81.3	68.5	55.8	51.8	47.7	43.7	40.0	32.5	26.3	20.0	16.9	13.8	11.2	9.30	7.75	7.0	6.20	5.9	5.50	4.80	2.45
TFT12-90	190.5	169.3	132.0	118.4	100.9	83.3	77.4	71.4	65.5	61.3	53.0	42.0	30.9	26.8	23.1	18.5	15.4	12.8	11.2	10.1	9.27	8.80	7.23	3.89
TFT12-95	199.0	152.0	132.0	117.7	103.3	89.0	81.7	74.3	67.0	62.7	54.2	43.5	32.8	28.5	24.3	20.0	17.1	14.1	12.6	11.0	10.1	9.20	7.90	4.02
TFT12-105	226.0	189.0	182.0	156.3	130.7	105.0	93.6	82.2	70.8	67.8	61.8	49.7	37.6	32.3	27.1	21.8	19.0	16.1	14.3	12.5	11.5	10.5	7.90	4.60
TFT12-130	277.0	214.8	186.5	166.3	146.0	125.8	115.4	105.0	94.7	88.6	76.6	61.5	46.3	40.3	34.3	28.3	24.1	19.9	17.7	15.5	14.3	13.0	11.2	5.68
TFT12-160	343.0	285.0	230.0	205.3	174.8	144.4	134.1	123.7	115.9	109.7	98.8	78.2	57.7	48.9	41.4	32.5	27.0	22.3	19.9	18.4	16.9	16.0	13.5	7.25
TFT12-170	355.0	302.7	237.2	211.7	180.3	148.9	138.2	127.6	119.5	113.1	101.9	80.7	59.5	50.5	42.7	33.5	27.8	23.0	20.5	19.0	17.4	16.5	13.9	7.48

Performance Data

Constant Power Discharge performance

Watts per cell

Constant Power Discharge (Watts per cell) at 20°C to 1.60 volts per cell																								
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	277.5	245.0	201.0	173.2	145.4	117.6	109.6	101.5	93.5	85.0	68.0	53.5	39.0	33.8	28.6	23.5	19.8	17.4	15.2	13.0	12.0	11.0	9.50	4.80
TFT12-90	464.0	360.0	285.8	250.4	215.0	179.6	164.0	148.4	132.8	126.1	112.6	79.9	63.0	53.2	46.8	38.0	32.6	27.8	23.9	21.5	19.1	17.4	14.9	7.65
TFT12-95	477.0	380.0	320.0	277.3	234.7	192.0	175.3	158.7	142.0	132.3	113.0	89.6	66.2	57.6	49.0	40.4	34.0	27.5	24.6	21.6	19.8	18.0	15.5	7.85
TFT12-105	542.0	460.0	395.0	336.7	278.3	220.0	198.7	177.3	156.0	146.7	128.0	100.3	72.5	63.0	53.5	44.0	37.3	30.5	27.2	23.8	21.8	19.8	17.0	8.65
TFT12-130	664.0	535.0	452.2	391.9	331.6	271.3	247.8	224.2	200.7	187.0	159.7	126.6	93.5	81.4	69.2	57.1	48.0	38.9	34.7	30.5	28.0	25.4	21.9	11.1
TFT12-160	828.0	590.0	490.0	429.3	368.6	307.9	281.1	254.4	235.1	225.6	209.9	148.9	117.4	97.2	83.6	66.6	57.1	48.8	42.3	38.0	34.9	32.5	27.7	14.3
TFT12-170	853.0	630.0	505.3	442.7	380.1	317.5	289.9	262.4	242.5	232.6	216.4	153.5	121.1	100.3	86.2	68.7	58.9	50.3	43.6	39.2	36.0	33.5	28.6	14.7

Constant Power Discharge (Watts per cell) at 20°C to 1.65 volts per cell																								
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	275.0	238.0	196.0	168.7	141.5	114.2	106.5	98.8	91.1	82.9	66.5	52.6	38.6	33.5	28.3	22.3	19.5	17.1	15.0	12.9	12.0	11.0	9.45	4.80
TFT12-90	434.5	350.3	278.4	243.7	209.0	174.3	159.7	145.2	130.7	123.6	109.4	77.9	61.1	52.1	46.2	37.5	32.1	27.2	23.5	21.1	18.9	17.3	14.8	7.63
TFT12-95	459.0	358.0	305.0	265.0	225.0	185.0	168.7	152.3	136.0	127.0	109.0	86.5	64.0	56.1	48.2	40.3	33.9	27.5	24.6	21.6	19.8	18.0	15.5	7.85
TFT12-105	522.0	418.0	375.0	321.7	268.3	215.0	193.7	172.3	151.0	142.0	124.0	98.0	72.0	62.5	53.1	43.6	37.1	30.5	27.1	23.7	21.8	19.8	17.0	8.64
TFT12-130	644.5	505.9	431.0	374.5	317.9	261.4	238.3	215.3	192.2	179.5	154.0	122.2	90.4	79.3	68.1	56.9	47.9	38.9	34.7	30.5	28.0	25.4	21.9	11.1
TFT12-160	795.0	576.7	477.3	417.8	358.2	298.7	273.8	249.0	231.4	221.1	203.9	145.1	113.9	95.1	82.7	65.7	56.2	47.6	41.6	37.4	34.5	32.3	27.5	14.2
TFT12-170	821.5	612.6	492.2	430.8	369.4	308.1	282.4	256.7	238.6	228.0	210.3	149.7	117.4	98.1	85.3	67.8	58.0	49.1	42.9	38.6	35.6	33.3	28.4	14.7

Constant Power Discharge (Watts per cell) at 20°C to 1.70 volts per cell																								
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	263.0	233.0	190.0	163.9	137.9	111.8	104.0	96.2	88.4	80.6	65.0	51.7	38.3	33.2	28.0	22.1	19.2	16.8	14.8	12.8	11.9	11.0	9.45	4.75
TFT12-90	425.0	343.0	270.9	237.3	203.6	170.0	155.8	141.7	127.5	121.1	108.4	76.7	60.1	51.3	45.5	37.0	31.5	26.8	23.2	21.0	18.9	17.2	14.8	7.61
TFT12-95	438.0	337.0	288.0	250.7	213.3	176.0	161.3	146.7	132.0	123.7	107.0	85.0	63.0	55.4	47.7	40.1	33.8	27.5	24.6	21.6	19.8	18.0	15.4	7.85
TFT12-105	499.0	387.0	356.0	306.0	256.0	206.0	186.3	166.7	147.0	138.7	122.0	96.7	71.4	62.0	52.6	43.2	36.8	30.4	27.1	23.7	21.8	19.8	16.9	8.63
TFT12-130	615.0	476.2	407.0	354.2	301.4	248.7	228.0	207.2	186.5	174.7	151.2	120.1	89.0	78.2	67.4	56.7	47.8	38.9	34.7	30.5	28.0	25.4	21.8	11.1
TFT12-160	757.0	564.5	464.5	406.8	349.1	291.5	267.2	242.9	225.7	216.7	202.0	143.0	112.1	93.7	81.4	64.8	55.1	46.9	41.0	37.2	34.5	32.1	27.5	14.2
TFT12-170	785.5	599.6	479.0	419.5	360.1	300.6	275.5	250.5	232.8	223.5	208.3	147.4	115.6	96.7	83.9	66.8	56.8	48.4	42.3	38.4	35.6	33.1	28.4	14.6

Performance Data

Constant Power Discharge performance

Watts per cell

Constant Power Discharge (Watts per cell) at 20°C to 1.75 volts per cell																								
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	237.0	228.0	185.0	159.8	134.6	109.4	101.6	93.8	86.0	78.5	63.5	50.7	37.8	32.8	27.8	22.0	18.8	16.5	14.6	12.7	11.8	10.9	9.40	4.75
TFT12-90	387.0	335.6	263.5	230.6	197.6	164.7	151.6	138.5	125.4	118.6	105.2	75.0	59.3	50.5	44.7	36.4	31.1	26.5	22.8	20.9	18.7	17.1	14.8	7.60
TFT12-95	396.0	316.0	272.0	238.0	204.0	170.0	156.7	143.3	130.0	121.3	104.0	82.9	61.8	54.5	47.1	39.8	33.6	27.4	24.5	21.5	19.7	17.9	15.4	7.85
TFT12-105	448.0	361.0	337.0	290.7	244.3	198.0	179.3	160.7	142.0	134.3	119.0	95.0	71.0	61.6	52.2	42.8	36.6	30.3	27.0	23.6	21.7	19.7	16.9	8.62
TFT12-130	552.0	446.5	384.3	336.3	288.3	240.2	221.4	202.5	183.7	171.4	147.0	117.1	87.3	77.0	66.6	56.2	47.5	38.7	34.5	30.4	27.8	25.3	21.8	11.1
TFT12-160	686.0	552.3	451.8	395.3	338.8	282.3	259.9	237.4	222.0	212.3	196.0	139.8	110.5	92.2	80.0	63.8	54.5	46.3	40.4	37.1	34.2	31.9	27.5	14.2
TFT12-170	708.0	586.7	465.9	407.6	349.4	291.2	268.0	244.8	228.9	218.9	202.1	144.2	113.9	95.0	82.5	65.8	56.2	47.8	41.7	38.2	35.2	32.9	28.4	14.6

Constant Power Discharge (Watts per cell) at 20°C to 1.80 volts per cell																								
Battery Type	5min	10min	15min	20min	25min	30min	35min	40min	45min	50min	1h	1.5h	2h	2.5h	3h	4h	5h	6h	7h	8h	9h	10h	12h	24h
TFT12-55	218.0	223.0	180.0	155.7	131.4	107.0	99.3	91.5	83.7	76.6	62.4	50.0	37.5	32.6	27.6	22.0	18.5	16.2	14.4	12.6	11.8	10.9	9.40	4.75
TFT12-90	352.0	328.3	255.0	223.1	191.3	159.4	147.0	134.6	122.2	115.5	102.0	73.5	58.3	49.7	44.1	35.9	30.6	26.1	22.5	20.7	18.6	17.0	14.8	7.57
TFT12-95	368.0	294.0	255.0	224.3	193.7	163.0	150.7	138.3	126.0	117.3	100.0	80.3	60.6	53.6	46.5	39.5	33.4	27.3	24.4	21.4	19.6	17.8	15.3	7.85
TFT12-105	418.0	328.0	318.0	274.7	231.3	188.0	171.0	154.0	137.0	129.7	115.0	92.8	70.5	61.2	51.8	42.5	36.4	30.2	26.9	23.6	21.7	19.7	16.9	8.62
TFT12-130	512.0	415.4	360.3	317.0	273.7	230.3	212.9	195.5	178.0	165.8	141.3	113.5	85.6	75.7	65.8	55.8	47.2	38.6	34.4	30.2	27.7	25.2	21.6	11.1
TFT12-160	634.0	540.1	437.2	382.5	327.9	273.2	252.0	230.7	216.3	206.6	190.1	137.0	108.7	90.8	78.9	62.9	53.6	45.8	39.9	36.7	34.0	31.7	27.5	14.1
TFT12-170	656.5	573.7	450.8	394.5	338.1	281.8	259.9	237.9	223.1	213.0	196.0	141.3	112.1	93.6	81.3	64.9	55.3	47.2	41.1	37.8	35.0	32.7	28.4	14.5

Selection of Battery Size

The following examples are designed to illustrate the method of determining which **ABT** ENDURO TFT Front 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 18.5 amps constant current will operate satisfactorily at a minimum battery terminal volts level of 42 volts.

Calculate the battery type required for 5 hours standby duration on the basis of:

(a) 20°C operating temperature

(b) 0°C 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 18.5 amps Constant current to 1.75Vpc

(3) By reference to constant current performance table relating to 1.75 volts per cell level (see page 6):

(a) at 20°C

TFT12-105 unit size is smallest available size to use (19.2 amps available).

Conclusion: Use 4 - TFT12-105

(b) at 0°C

By reference to the table on page 11 of this product guide, available current output at 20 is reduced by factor 0.83.
The refore at 0°C- 5 hours output is reduced to, on TFT12-105 size, 19.2 amps x 0.83
= 15.9 amps.

Hence TFT12-105 unit size too small!
Try the next largest unit size - TFT12-130. At 0°C available current output is 24.2 amps x 0.83
=20.1 amps.

Conclusion: Use 4 - TFT12-130

Constant power discharge

EXAMPLE B. To demonstrate constant power calculation.

An inverter system requires a D.C. constant power input of 90 kW in the voltage range 451 volts maximum, 317 volts minimum.

Calculate the optimum battery size required for operation for a 10 min standby period.

METHOD

(1) Number of cells
= 451/2.27Vpc = 199 cells.

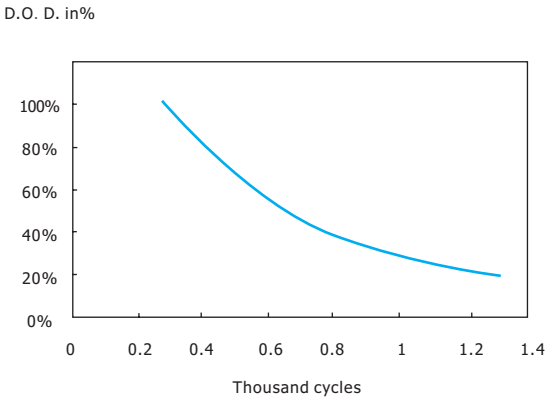
(2) Minimum volt per cell
317/199 = 1.6Vpc.

(3) Watts per cell
= 90000 watts / 199 cells = 452watts per cell.

(4) Hence cell performance requirement is 452 watts to 1.6Vpc at 20°C .

(5) By reference to the constant power performance table (see page 7) relating to 1.6 volts per cell level,TFT12-105 monobloc is the correct available size to use.

Cycle life vs depth of discharge



Technology

Principle of VRLA batteries

During charging of conventional lead acid battery, electrolysis of water occurs 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 that 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, i.e. oxygen is electrochemically reduced on the negative plate according to the following formula,

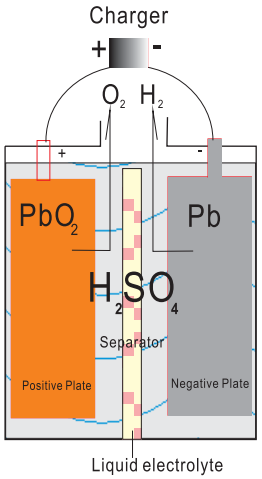
$$2e^{-}+2H^{+}+1/2O_2 \rightarrow H_2O$$

and the final product is water.

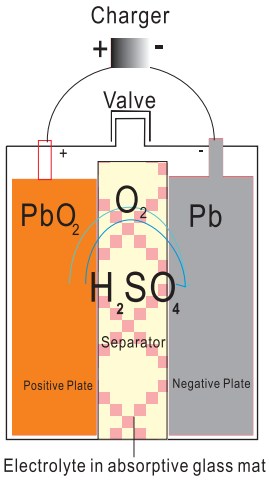
The current flowing through the negative plate drives this reaction instead of hydrogen evolution which occur in a conventional battery.

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

Principle of the oxygen reduction cycle



Conventional cell
Oxygen and hydrogen escape to the atmosphere



Enduro TFT
Oxygen from the positive plate transfers to the negative and recombines to form water

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 batteries through the safety valve. The volume of gas emitted is very small and typical average values on constant potential float at 20°C are as follows:

Float voltage (V)	Volume of gas emitted (ml per cell C_{10} Ah per month)
13.5~13.74	3.2
14.4~14.7	25.0

Operating Characteristics

The **ENDURO TFT** Front Terminal units should be charged using constant potential chargers.

Float voltage

At normal room temperature (20°C), the recommended float voltage is equal to 2.27 volts 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 (°C)	Float voltage range per cell
0°C	2.31-2.35
10°C	2.29-2.33
20°C	2.25-2.29
25°C	2.24-2.28
30°C	2.23-2.27
35°C	2.22-2.26
40°C	2.21-2.25

Under these conditions a recharge 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 0.2 C_{10} (A) is adequate.

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

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

Fast recharge

Increasing the charge voltage to 14.4~14.7 volts 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 be terminated 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 0.2 C_{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 on capacity

Temperature affects capacity of batteries. Correction factors for capacity at different temperatures are shown in the following table, the reference temperature being 20°C.

	Battery temperature											
Duration of discharge	-15°C	-10°C	-5°C	0°C	5°C	10°C	15°C	20°C	25°C	30°C	35°C	40°C
15min	0.50	0.56	0.63	0.70	0.77	0.84	0.92	1.00	1.08	1.16	1.24	1.31
1 hour	0.62	0.67	0.73	0.78	0.84	0.89	0.95	1.00	1.05	1.10	1.15	1.20
10hour	0.73	0.77	0.81	0.85	0.89	0.93	0.96	1.00	1.03	1.06	1.09	1.11

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 2.27 volts per cell with the current limited to a maximum of 0.2 C_{10}(A) in order to prevent excessive internal heating. For instance, for a Enduro TFT12-105 the maximum charge current is 21 amps. If the sulphation of the cell/battery is extensive, then the recharge 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 (Ampere)	Final discharge Voltage (Vpc)
$I \leq 0.25C_{10}$	1.80
$0.25C_{10} < I \leq 0.55C_{10}$	1.75
$0.55C_{10} < I \leq 1.0C_{10}$	1.60
$1.0C_{10} < I$	1.50

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 5% and 100% load.

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 circumstances 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 EN 50226 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 purposes electromagnetically 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 (N x 2.27V) for a temperature of 20°C.

  N = the number of cells in the battery and 2.27V = 20°C float voltage.
- Once a year, take a reading of the individual bloc voltages in the battery. A variation 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 and Commissioning Charge

Warning

ABT Enduro TFT 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.

Setting 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 levels of torque indicated on the product label.

Always use insulated tools for fitting and torquing up battery connections.

- In series

The number of cells in series (N) will not affect the selected float voltage per cell.
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 special circuit arrangements are required, where the parallel connection is made at the charger or distribution board, to avoid out of step conditions,the bus bar run length and the area of cross section should be designed so that the circuit resistance value for each string is equal within limits ±

General recommendations

- Do not wear clothing of synthetic material to avoid static generation.
- Use only a clean soft damp cloth for cleaning the monoblocs. Do not use chemicals or detergents.
- Use insulated tools.
- Commence installation at the least accessible point.
- Consult the drawing for the correct position of the monobloc's 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°C for 48 to 96 hours or, alternatively, a voltage of 14.4~14.7V/battery at 20°C 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%	⩾2.18
80%	⩾2.15
60%	⩾2.10
40%	⩾2.07
20%	⩾2.03

Open circuit voltage variation with temperature is 2.5mV/cell per 10℃.

Recharge of stored batteries

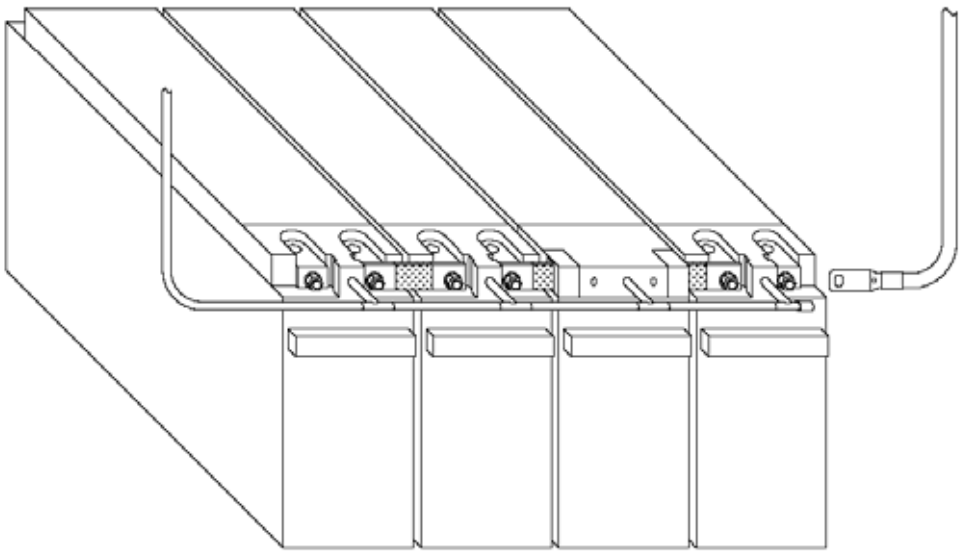
A refreshing charge shall be performed after this time at 13.5-13.74V/ battery at 20℃ for 48 to 96 hours. A current limit is not essential, but for optimum charge efficiency the current output of the charger can be limited to 20% of the 10-hour rated capacity.

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 result in greatly reduced capacity and service life.

Battery Accommodation

The ABT Front Terminal battery's compact design and standard footprint, suitable for 19' ,23' and ETSI racking, give users the benefit of increased energy density.
With all electrical connections at the front, installation and inspection are simpler and quicker.



ABT VRLA Battery:

PowerLine/Thunder/Enduro/Sunwind/e-Trek

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

Shandong Sacred Sun Power Sources Co.,Ltd.

Add: 1, Shengyang Road, Qufu 273100 China
Tel: 86-537-4438 666 extn 6028 Fax:86-537-4411 936
Website: www.abtbatt.com www.sacredsun.com
Email: sales@abtbatt.com

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