

# **Technical Manual**

## **Motive Power Flooded and Gel**

***Motive Power Technical Manual***

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# Technology Behind Motive Power Flooded

## Exide Motive Power Cells

The Exide motive power batteries provide a high level of power and reliability for all industrial truck applications, from simple applications with a low capacity loading up to heavy duty multi-shift applications.

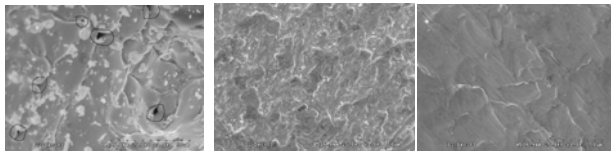
### Strength of Exide Motive Power

**Technology-** Exide Motive Power cells comes in a huge range of the Normal and the Enhanced version. The design has been optimized to maximize the utilization of the positive and negative electrodes. Usage of Advanced components for the manufacturing of electrodes gives higher discharge efficiency.

The usage of highly porous and resilient Non-Woven Gauntlets and high precision filling system along with temperature controlled 2 shot recirculation formation of the cells has enabled a marked improvement in discharge characteristics and cycle life of the cells. Both Normal and Enhanced range is at the highest technology level and has a very high efficiency. This improvement integrates the European harmonization of the DIN and BS ranges. This range meets the dimensions of standards DIN/EN 60254 and IEC 254-2.

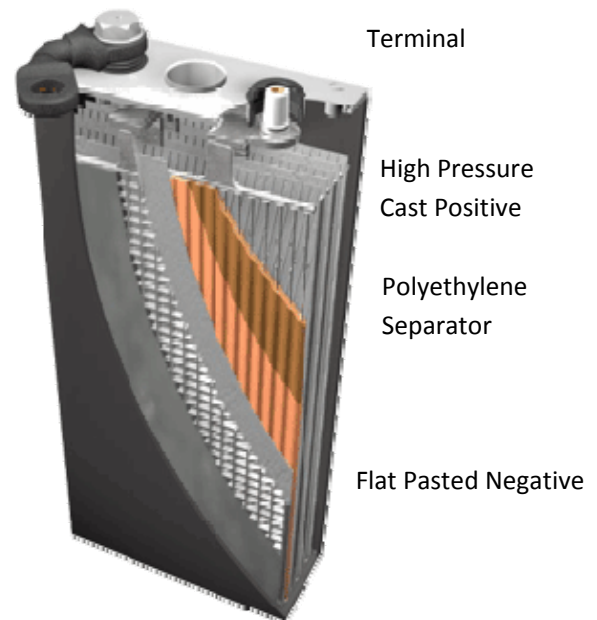
**Cell Construction-** Exide Normal and Enhanced cells use the robust tubular vented technology (PzS and PzB). The positive electrodes are die cast tubular plates (PzS and PzB) and advanced components used in their manufacture provide increased efficiency. The negative plates are flat pasted plates. The cell box and lid are made from high impact, temperature resistant polypropylene and are heat-seal welded to prevent electrolyte leakage.

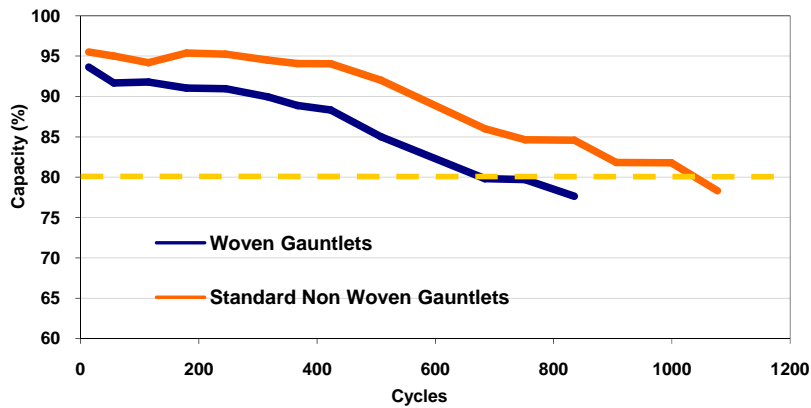
- **Positive Plate:** The backbone of the plate. The positive spines are cast at incredibly high pressure with a special antimony alloy of 5%.



Gravity Cast      Low Pressure      Exide High Pressure

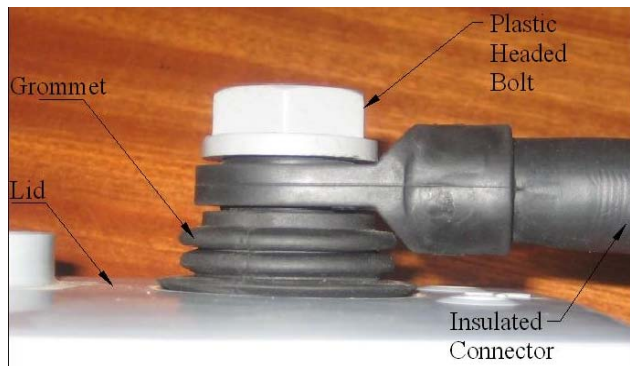
- **Negative Plate:** Flat Grid design for superior adherence of active material.
- **Terminal and Terminal Seal:** Exide motive Power comes in two versions i.e. Bolted and Welded .
- **Gauntlet:** Imported Non-Woven gauntlet with high volume porosity , low electrical resistance and high resilience enhances the discharge performance of the cells.





Non-woven gauntlets with high volume porosity, enhances the discharge performance and the cycle of the cells.

### Bolted Terminal Technology



#### **Technological Advantage**

- Use of Imported technology Bolt-On Terminals with Brass inserts would provide better electrical performance.
- Replacement of any accessories associated with the battery i.e Connector, Take off etc, is easier and can be done in less amount of time.
- Bolt-on technology prevents wear and tear of the terminals which was unavoidable in weld-on terminals.
- Bolt-On Pillars is used with Imported Technology Grommets which is designed to arrest acid seepage and prevent terminal corrosion. The Grommets are also designed to nullify the effect of plate growth.

## Welded Terminal Technology



### Innovative Twin-Shot Post seal for the Welded Type

- The Grommet fuses with the Lid creating a single entity.
  - Grommets stay in its designed position all throughout its life, maintaining a perfect seal.
  - Zero path for acid leakage

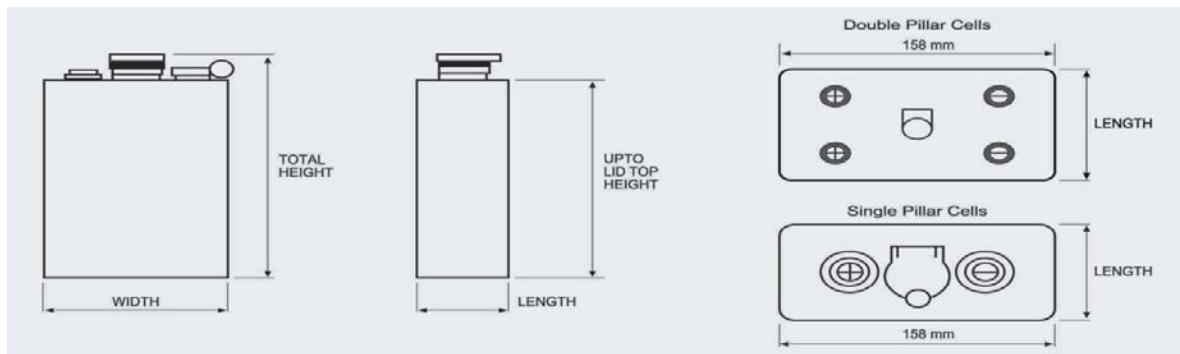
### Terminal Configuration

#### BS Standard (Weld-On)

- Single Pillar from 5 plate cells to 23 Plate Cells
- Double Pillar for 25 plate cells and 27 plate Cells

#### BS Standard (Bolt-On)

- Single Pillar from 5plate cells to 23 Plate Cells
- Double Pillar from 17 plate to 27 Plate Cells



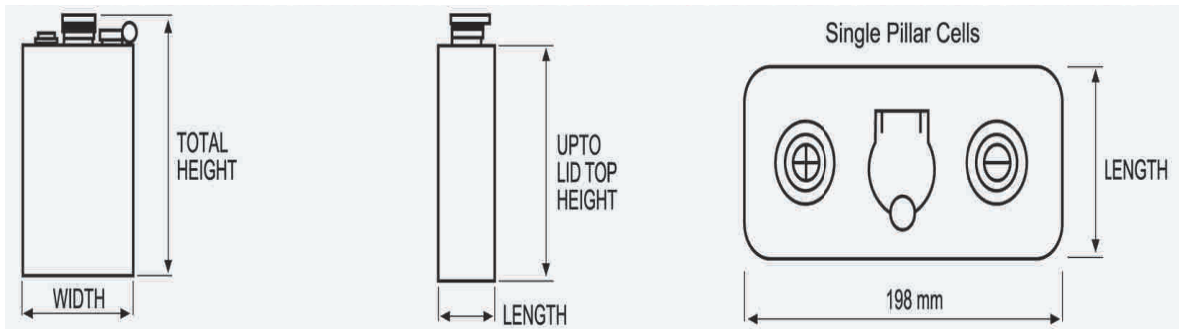
## DIN Standard

### DIN Standard (Weld-On)

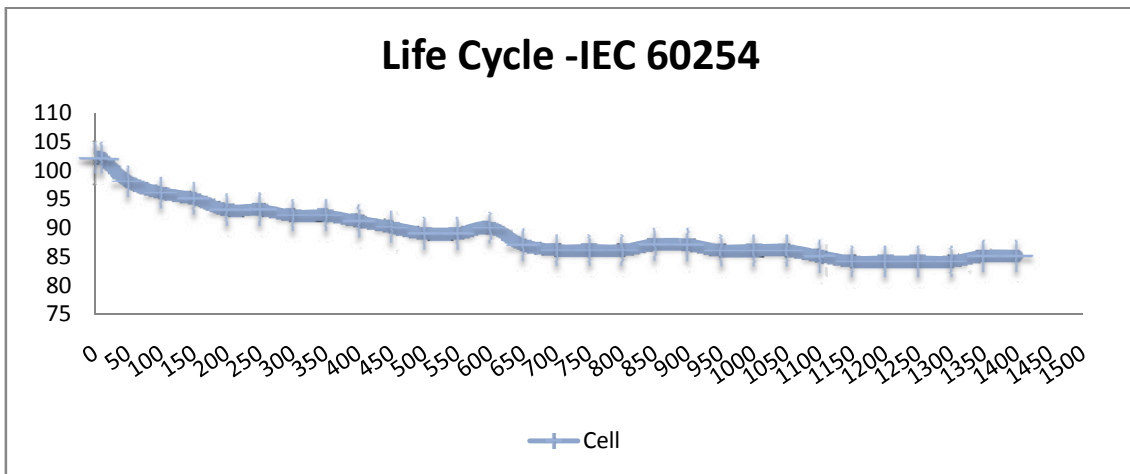
- Single Pillar from 5 plate cells to 21 Plate Cells

### DIN Standard (Bolt-On)

- Single Pillar from 5plate cells to 21 Plate Cells



## Life Cycle Trend





# Enhanced Range

## Details of Enhanced Type DIN Specification Traction Cells (Width 198mm)

### Enhanced Range of Motive Power Cells

Cell type	Ah @C5 at 30° C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell type	Ah @C5 at 30° C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)		
Positive Plate Capacity 50 Ah, Overall Height 309 mm, Height upto Lid Top 279 mm						Positive Plate Capacity 60 Ah, Overall Height 362 mm, Height upto Lid Top 332 mm							
2 IPzS 100	ELXWAF5	100	47	5.5	1.2	7.0	2 IPzS 120	EXWAF5	120	47	6.5	1.4	8.3
3 IPzS 150	ELXWAF7	150	65	7.8	1.9	10.2	3 IPzS 180	EXWAF7	180	65	9.3	2.2	12.2
4 IPzS 200	ELXWAF9	200	83	10.1	2.5	13.3	4 IPzS 240	EXWAF9	240	83	12.1	3.0	15.9
5 IPzS 250	ELXWAF11	250	101	12.4	3.0	16.4	5 IPzS 300	EXWAF11	300	101	14.9	3.6	19.6
6 IPzS 300	ELXWAF13	300	119	14.8	3.7	19.5	6 IPzS 360	EXWAF13	360	119	17.7	4.4	23.4
7 IPzS 350	ELXWAF15	350	137	17.1	4.3	22.6	7 IPzS 420	EXWAF15	420	137	20.5	5.1	27.1
8 IPzS 400	ELXWAF17	400	155	19.4	4.9	25.7	8 IPzS 480	EXWAF17	480	155	23.3	5.8	30.8
9 IPzS 450	ELXWAF19	450	173	21.8	5.5	28.5	9 IPzS 540	EXWAF19	540	173	26.1	6.6	34.6
10 IPzS 500	ELXWAF21	500	191	24.1	6.1	31.9	10 IPzS 600	EXWAF21	600	191	28.9	7.3	38.2
Cell type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell type	Ah @C5 at 30° C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)		
Positive Plate Capacity 80 Ah, Overall Height 430 mm, Height upto Lid Top 400 mm						Positive Plate Capacity 90 Ah, Overall Height 450mm, Height upto Lid Top 460mm							
2 IPzS 160	EXWBF5	160	47	8.5	1.7	10.8	2 IPzS 180	EXWCF5	180	47	9.2	2.0	11.8
3 IPzS 240	EXWBF7	240	65	12.2	2.7	15.6	3 IPzS 270	EXWCF7	270	65	13.3	3.1	17.3
4 IPzS 320	EXWBF9	320	83	15.7	3.6	20.4	4 IPzS 360	EXWCF9	360	83	17.3	4.2	22.7
5 IPzS 400	EXWBF11	400	101	19.3	4.4	25.0	5 IPzS 450	EXWCF11	450	101	21.4	5.1	28.1
6 IPzS 480	EXWBF13	480	119	22.9	5.4	29.9	6 IPzS 540	EXWCF13	540	119	25.5	6.2	33.6
7 IPzS 560	EXWBF15	560	137	26.6	6.2	34.5	7 IPzS 630	EXWCF15	630	137	29.6	7.2	38.9
8 IPzS 640	EXWBF17	640	155	30.2	7.1	39.3	8 IPzS 720	EXWCF17	720	155	33.7	8.2	44.3
9 IPzS 720	EXWBF19	720	173	33.8	8.0	44.1	9 IPzS 810	EXWCF19	810	173	37.8	9.3	49.8
10 IPzS 800	EXWBF21	800	191	37.4	8.8	48.7	10 IPzS 900	EXWCF21	900	191	41.9	10.2	55.1

### Enhanced Range of Motive Power Cells

Cell type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)		
Positive Plate Capacity 105 Ah, Overall Height 540mm, Height upto Lid Top 510mm						Positive Plate Capacity 115 Ah, Overall Height 565mm, Height upto Lid Top 535mm							
2 IPzS 210	EHXWCF5	210	47	10.3	2.2	13.2	2 IPzS 230	ELXWCF5	230	47	10.9	2.3	13.9
3 IPzS 315	EHXWCF7	315	65	15.0	3.5	19.5	3 IPzS 345	ELXWCF7	345	65	15.9	3.7	20.6
4 IPzS 420	EHXWCF9	420	83	19.6	4.6	25.6	4 IPzS 460	ELXWCF9	460	83	20.7	4.9	27.0
5 IPzS 525	EHXWCF11	525	101	24.2	5.7	31.5	5 IPzS 575	ELXWCF11	575	101	25.6	6.0	33.3
6 IPzS 630	EHXWCF13	630	119	28.8	6.9	37.8	6 IPzS 690	ELXWCF13	690	119	30.5	7.3	39.9
7 IPzS 735	EHXWCF15	735	137	33.5	8.0	43.8	7 IPzS 805	ELXWCF15	805	137	35.4	8.4	46.2
8 IPzS 840	EHXWCF17	840	155	38.1	9.1	49.9	8 IPzS 920	ELXWCF17	920	155	40.3	9.6	52.7
9 IPzS 945	EHXWCF19	945	173	42.7	10.3	56.1	9 IPzS 1035	ELXWCF19	1035	173	45.2	10.9	59.2
10 IPzS 1050	EHXWCF21	1050	191	47.4	11.4	62.1	10 IPzS 1150	ELXWCF21	1150	191	50.1	12.0	65.6
Cell type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)		
Positive Plate Capacity 125 Ah, Overall Height 601mm, Height upto Lid Top 571mm						Positive Plate Capacity 140 Ah, Overall Height 715mm, Height upto Lid Top 685mm							
2 IPzS 250	EXWCF5	250	47	11.7	2.5	14.9	2 IPzS 280	ELXWCF5	280	47	13.6	3.0	17.5
3 IPzS 375	EXWCF7	375	65	17.0	3.9	22.1	3 IPzS 420	ELXWCF7	420	65	19.8	4.7	25.9
4 IPzS 500	EXWCF9	500	83	22.3	5.2	29.0	4 IPzS 560	ELXWCF9	560	83	26.0	6.3	34.0
5 IPzS 625	EXWCF11	625	101	27.5	6.4	35.8	5 IPzS 700	ELXWCF11	700	101	32.1	7.7	42.0
6 IPzS 750	EXWCF13	750	119	32.8	7.8	42.8	6 IPzS 840	ELXWCF13	840	119	38.3	9.3	50.3
7 IPzS 875	EXWCF15	875	137	38.1	9.0	49.7	7 IPzS 980	ELXWCF15	980	137	44.5	10.8	58.4
8 IPzS 1000	EXWCF17	1000	155	43.4	10.3	56.6	8 IPzS 1120	ELXWCF17	1120	155	50.6	12.3	66.5
9 IPzS 1125	EXWCF19	1125	173	48.6	11.6	63.6	9 IPzS 1260	ELXWCF19	1260	173	56.8	14.0	74.8
10 IPzS 1250	EXWCF21	1250	191	53.9	12.8	70.4	10 IPzS 1400	ELXWCF21	1400	191	63.0	15.4	82.8

Cell type		Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)
Positive Plate Capacity 155 Ah, Overall Height 742mm, Height upto Lid Top 712mm						
2 IPzS 310	EXWFF5	310	47	14.2	3.2	18.3
3 IPzS 465	EXWFF7	465	65	20.7	4.3	27.1
4 IPzS 620	EXWFF9	620	83	27.1	6.5	35.6
5 IPzS 775	EXWFF11	775	101	33.6	8.1	44.0
6 IPzS 930	EXWFF13	930	119	40.0	9.8	52.7
7 IPzS 1085	EXWFF15	1085	137	46.5	11.3	61.1
8 IPzS 1240	EXWFF17	1240	155	53.0	12.9	69.6
9 IPzS 1395	EXWFF19	1395	173	59.4	14.6	78.3
10 IPzS 1550	EXWFF21	1550	191	65.9	16.1	86.7

## Enhanced Range

### Details of Enhanced Type BS Specification Traction Cells (Width 158mm)

Enhanced Range of Motive Power Cells													
Cell type		Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell type		Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)
Positive Plate Capacity 32 Ah, Overall Height 294 mm, Height upto Lid Top 264 mm							Positive Plate Capacity 42 Ah, Overall Height 353 mm, Height upto Lid Top 323 mm						
2 IPzB 64	EXXVF5	64	45	4.2	1.0	5.4	2 IPzB 84	EXIMF5	84	45	5.2	1.3	6.8
3 IPzB 96	EXXVF7	96	61	5.8	1.3	7.5	3 IPzB 126	EXIMF7	126	61	7.2	1.8	9.5
4 IPzB 128	EXXVF9	128	77	7.4	1.7	9.6	4 IPzB 168	EXIMF9	168	77	9.3	2.3	12.3
5 IPzB 160	EXXVF11	160	93	9.0	2.1	11.7	5 IPzB 210	EXIMF11	210	93	11.4	2.8	15.0
6 IPzB 192	EXXVF13	192	109	10.6	2.5	13.8	6 IPzB 252	EXIMF13	252	109	13.5	3.3	17.7
7 IPzB 224	EXXVF15	224	125	12.2	2.8	15.9	7 IPzB 294	EXIMF15	294	125	15.5	3.8	20.4
8 IPzB 256	EXXVF17	256	141	13.9	3.2	18.1	8 IPzB 336	EXIMF17	336	141	17.7	4.3	23.2
9 IPzB 288	EXXVF19	288	157	16.1	3.6	20.7	9 IPzB 378	EXIMF19	378	157	20.3	4.8	26.5
10 IPzB 320	EXXVF21	320	173	17.7	4.0	22.8	10 IPzB 420	EXIMF21	420	173	22.4	5.3	29.2
11 IPzB 352	EXXVF23	352	189	19.3	4.4	25.0	11 IPzB 462	EXIMF23	462	189	24.5	5.8	32.0
12 IPzB 384	EXXVF25	384	205	20.9	4.7	27.0	12 IPzB 504	EXIMF25	504	205	26.5	6.3	34.7
13 IPzB 416	EXXVF27	416	221	22.5	5.1	29.1	13 IPzB 546	EXIMF27	546	221	28.6	6.8	37.4
Cell type		Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell type		Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)
Positive Plate Capacity 55 Ah, Overall Height 430 mm, Height upto Lid Top 400 mm							Positive Plate Capacity 65 Ah, Overall Height 480 mm, Height upto Lid Top 450 mm						
2 IPzB 110	EXILF5	110	45	6.3	1.6	8.3	2 IPzB 130	EXTLF5	130	45	7.0	1.8	9.2
3 IPzB 165	EXILF7	165	61	8.8	2.2	11.6	3 IPzB 195	EXTLF7	195	61	9.8	2.4	13.0
4 IPzB 220	EXILF9	220	77	11.4	2.8	15.0	4 IPzB 260	EXTLF9	260	77	12.7	3.1	16.8
5 IPzB 275	EXILF11	275	93	13.9	3.4	18.3	5 IPzB 325	EXTLF11	325	93	15.6	3.7	20.4
6 IPzB 330	EXILF13	330	109	16.5	4.0	21.6	6 IPzB 390	EXTLF13	390	109	18.5	4.5	24.2
7 IPzB 385	EXILF15	385	125	19.0	4.6	25.0	7 IPzB 455	EXTLF15	455	125	21.4	5.1	28.0
8 IPzB 440	EXILF17	440	141	21.6	5.3	28.4	8 IPzB 520	EXTLF17	520	141	24.3	5.9	31.8
9 IPzB 495	EXILF19	495	157	24.7	5.9	32.3	9 IPzB 585	EXTLF19	585	157	27.7	6.5	36.1
10 IPzB 550	EXILF21	550	173	27.2	6.5	35.6	10 IPzB 650	EXTLF21	650	173	30.5	7.2	39.8
11 IPzB 605	EXILF23	605	189	29.9	7.1	39.0	11 IPzB 715	EXTLF23	715	189	33.5	7.9	43.7
12 IPzB 660	EXILF25	660	205	32.4	7.7	42.3	12 IPzB 780	EXTLF25	780	205	36.4	8.6	47.4
13 IPzB 715	EXILF27	715	221	34.9	8.3	45.6	13 IPzB 845	EXTLF27	845	221	39.3	9.2	51.1

Enhanced Range of Motive Power Cells													
Cell type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)		
Positive Plate Capacity 75 Ah, Overall Height 535 mm, Height upto Lid Top 509 mm						Positive Plate Capacity 85 Ah, Overall Height 597 mm, Height upto Lid Top 567 mm							
2 IPzB 150	EXTHF5	150	45	7.8	2.0	10.4	2 IPzB 172	EXTOF5	172	45	8.6	2.2	11.5
3 IPzB 225	EXTHF7	225	61	11.1	2.7	14.6	3 IPzB 258	EXTOF7	258	61	12.5	3.0	16.4
4 IPzB 300	EXTHF9	300	77	14.3	3.5	18.9	4 IPzB 344	EXTOF9	344	77	16.3	3.9	21.3
5 IPzB 375	EXTHF11	375	93	17.6	4.2	22.9	5 IPzB 430	EXTOF11	430	93	20.1	4.7	26.1
6 IPzB 450	EXTHF13	450	109	20.8	5.0	27.2	6 IPzB 516	EXTOF13	516	109	23.9	5.6	31.1
7 IPzB 525	EXTHF15	525	125	24.0	5.7	31.4	7 IPzB 602	EXTOF15	602	125	27.7	6.4	36.0
8 IPzB 600	EXTHF17	600	141	27.3	6.5	35.8	8 IPzB 688	EXTOF17	688	141	31.5	7.3	41.0
9 IPzB 675	EXTHF19	675	157	31.2	7.2	40.5	9 IPzB 774	EXTOF19	774	157	35.9	8.1	46.4
10 IPzB 750	EXTHF21	750	173	34.3	8.0	44.6	10 IPzB 860	EXTOF21	860	173	39.6	9.0	51.2
11 IPzB 825	EXTHF23	825	189	37.6	8.8	49.0	11 IPzB 946	EXTOF23	946	189	43.6	9.9	56.3
12 IPzB 900	EXTHF25	900	205	40.9	9.5	53.2	12 IPzB 1032	EXTOF25	1032	205	47.3	10.7	61.1
13 IPzB 975	EXTHF27	975	221	44.1	10.3	57.4	13 IPzB 1118	EXTOF27	1118	221	51.2	11.5	66.0
Cell type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)		
Positive Plate Capacity 100 Ah, Overall Height 634 mm, Height upto Lid Top 604 mm						Positive Plate Capacity 108 Ah, Overall Height 708 mm, Height upto Lid Top 678 mm							
2 IPzB 200	ELXTEF5	200	45	9.4	2.4	12.4	2 IPzB 216	EXTEF5	216	45	10.4	2.6	13.8
3 IPzB 300	ELXTEF7	300	61	13.6	3.3	17.8	3 IPzB 324	EXTEF7	324	61	15.0	3.6	19.7
4 IPzB 400	ELXTEF9	400	77	17.7	4.2	23.2	4 IPzB 432	EXTEF9	432	77	19.7	4.7	25.7
5 IPzB 500	ELXTEF11	500	93	21.9	5.0	28.4	5 IPzB 540	EXTEF11	540	93	24.3	5.6	31.5
6 IPzB 600	ELXTEF13	600	109	26.0	6.0	33.8	6 IPzB 648	EXTEF13	648	109	28.9	6.7	37.5
7 IPzB 700	ELXTEF15	700	125	30.2	6.9	39.0	7 IPzB 756	EXTEF15	756	125	33.5	7.6	43.4
8 IPzB 800	ELXTEF17	800	141	34.4	7.9	44.6	8 IPzB 864	EXTEF17	864	141	38.2	8.8	49.5
9 IPzB 900	ELXTEF19	900	157	39.1	8.8	50.4	9 IPzB 972	EXTEF19	972	157	43.4	9.7	56.0
10 IPzB 1000	ELXTEF21	1000	173	43.1	9.7	55.6	10 IPzB 1080	EXTEF21	1080	173	47.9	10.7	61.7
11 IPzB 1100	ELXTEF23	1100	189	47.4	10.6	61.1	11 IPzB 1188	EXTEF23	1188	189	52.7	11.8	67.9
12 IPzB 1200	ELXTEF25	1200	205	51.6	11.5	66.4	12 IPzB 1296	EXTEF25	1296	205	57.3	12.8	73.7
13 IPzB 1300	ELXTEF27	1300	221	55.7	12.4	71.7	13 IPzB 1404	EXTEF27	1404	221	61.9	13.7	79.7

# Normal Range

## Details of Normal Type DIN Specification Traction Cells (Width 198mm)

Normal Range of Motive Power Cells

Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)
Positive Plate Capacity 60 Ah, Overall Height 378 mm, Height upto Lid Top 348						Positive Plate Capacity 80 Ah, Overall Height 445 mm, Height upto Lid Top 415					
XWAF5	120	47	6.4	1.5	8.3	XWBF5	160	47	8.2	1.7	10.5
XWAF7	180	65	9.1	2.3	12.1	XWBF7	240	65	11.7	2.7	15.3
XWAF9	240	83	11.8	3.0	15.7	XWBF9	320	83	15.2	3.6	19.9
XWAF11	300	101	14.5	3.7	19.3	XWBF11	400	101	18.6	4.5	24.4
XWAF13	360	119	17.3	4.5	23.1	XWBF13	480	119	22.1	5.4	29.1
XWAF15	420	137	20.0	5.2	26.7	XWBF15	560	137	25.6	6.3	33.7
XWAF17	480	155	22.8	5.9	30.5	XWBF17	640	155	29.2	7.2	38.4
XWAF19	540	173	25.5	6.7	34.2	XWBF19	720	173	32.6	8.1	43.1
XWAF21	600	191	28.3	7.4	37.8	XWBF21	800	191	36.1	9.0	47.7
Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)
Positive Plate Capacity 90 Ah, Overall Height 454 mm, Height upto Lid Top 464						Positive Plate Capacity 110 Ah, Overall Height 522mm, Height upto Lid Top					
XWCF5	180	47	8.9	2.0	11.5	LXWFE5	220	47	11.5	2.3	14.5
XWCF7	270	65	12.8	3.1	16.8	LXWFE7	330	65	16.5	3.7	21.2
XWCF9	360	83	16.6	4.1	21.9	LXWFE9	440	83	21.4	4.9	27.7
XWCF11	450	101	20.4	5.1	26.9	LXWFE11	550	101	26.3	6.0	34.1
XWCF13	540	119	24.2	6.2	32.1	LXWFE13	660	119	31.2	7.3	40.7
XWCF15	630	137	28.0	7.1	37.2	LXWFE15	770	137	36.2	8.5	47.1
XWCF17	720	155	32.0	8.1	42.4	LXWFE17	880	155	41.2	9.7	53.7
XWCF19	810	173	35.8	9.2	47.7	LXWFE19	990	173	46.1	11.0	60.3
XWCF21	900	191	39.6	10.1	52.7	LXWFE21	1100	191	51.1	12.1	66.6

Normal Range of Motive Power Cells

Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)
Positive Plate Capacity 110 Ah, Overall Height 611mm, Height upto Lid Top						Positive Plate Capacity 140 Ah, Overall Height 729mm, Height upto Lid Top					
XWEF5	220	47	11.8	2.5	15.1	LXWFF5	280	47	14.3	3.0	18.3
XWEF7	330	65	16.8	4.0	22.0	LXWFF7	420	65	20.5	4.8	26.7
XWEF9	440	83	21.7	5.3	28.6	LXWFF9	560	83	26.6	6.4	34.8
XWEF11	550	101	26.6	6.5	35.1	LXWFF11	700	101	32.6	7.8	42.7
XWEF13	660	119	31.6	7.9	41.8	LXWFF13	840	119	38.7	9.5	51.0
XWEF15	770	137	36.5	9.2	48.4	LXWFF15	980	137	44.8	11.0	59.0
XWEF17	880	155	41.7	10.5	55.3	LXWFF17	1120	155	51.2	12.6	67.4
XWEF19	990	173	46.7	11.9	62.0	LXWFF19	1260	173	57.3	14.2	75.6
XWEF21	1100	191	51.6	13.1	68.5	LXWFF21	1400	191	63.4	15.7	83.6
Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)						
Positive Plate Capacity 140 Ah, Overall Height 753mm, Height upto Lid Top											
XWFF5	280	47	14.4	3.2	18.6						
XWFF7	420	65	20.6	5.0	27.1						
XWFF9	560	83	26.7	6.6	35.3						
XWFF11	700	101	32.8	8.2	43.4						
XWFF13	840	119	39.0	9.9	51.8						
XWFF15	980	137	45.1	11.5	59.9						
XWFF17	1120	155	51.5	13.1	68.4						
XWFF19	1260	173	57.6	14.8	76.8						
XWFF21	1400	191	63.8	16.3	84.9						

# Normal Range

## Details of Normal Type BS Specification Traction Cells (Width 158mm)

Normal Range of Motive Power Cells

Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)
mm						mm					
XXVF5	58	45	3.8	0.9	4.9	XIMF5	80	45	4.8	1.2	6.3
XXVF7	87	61	5.3	1.2	6.8	XIMF7	120	61	6.7	1.7	8.9
XXVF9	116	77	6.8	1.6	8.8	XIMF9	160	77	8.6	2.2	11.5
XXVF11	145	93	8.2	1.9	10.7	XIMF11	200	93	10.6	2.6	14.0
XXVF13	174	109	9.7	2.3	12.6	XIMF13	240	109	12.5	3.2	16.6
XXVF15	203	125	11.2	2.6	14.5	XIMF15	280	125	14.4	3.6	19.1
XXVF17	232	141	12.7	3	16.5	XIMF17	320	141	16.4	4.2	21.8
XXVF19	261	157	14.7	3.3	19	XIMF19	360	157	18.9	4.6	24.8
XXVF21	290	173	16.3	3.6	21	XIMF21	400	173	20.9	5.1	27.5
XXVF23	319	189	17.8	4	23	XIMF23	440	189	22.9	5.6	30.1
XXVF25	348	205	19.3	4.4	24.9	XIMF25	480	205	24.8	6.1	32.6
XXVF27	377	221	20.7	4.7	26.8	XIMF27	520	221	26.7	6.6	35.2
Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)
Positive Plate Capacity 54 Ah, Overall Height 437 mm, Height upto Lid Top 407						Positive Plate Capacity 63 Ah, Overall Height 488 mm, Height upto Lid Top 458					
XILF5	108	45	5.7	1.5	7.6	XTLF5	126	45	6.4	1.7	8.5
XILF7	162	61	8.0	2.1	10.7	XTLF7	189	61	9.9	2.2	12.8
XILF9	216	77	10.3	2.7	13.8	XTLF9	252	77	12.6	3.0	16.4
XILF11	270	93	13.4	3.1	17.5	XTLF11	315	93	15.2	3.6	19.8
XILF13	324	109	15.8	3.8	20.6	XTLF13	378	109	17.9	4.3	23.4
XILF15	378	125	18.1	4.3	23.7	XTLF15	441	125	20.5	4.9	26.8
XILF17	432	141	20.5	5.0	26.9	XTLF17	504	141	23.7	5.7	31.0
XILF19	486	157	23.3	5.5	30.5	XTLF19	567	157	26.3	6.3	34.5
XILF21	540	173	25.6	6.2	33.6	XTLF21	630	173	29.0	7.0	38.0
XILF23	594	189	28.1	6.7	36.8	XTLF23	693	189	31.7	7.7	41.6
XILF25	648	205	30.4	7.3	39.8	XTLF25	756	205	34.4	8.3	45.1
XILF27	702	221	32.7	7.9	42.9	XTLF27	819	221	37.0	9.0	48.6

Normal Range of Motive Power Cells

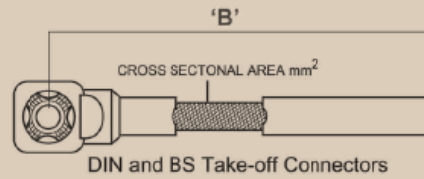
Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)	Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)
Positive Plate Capacity 73 Ah, Overall Height 544 mm, Height upto Lid Top 514						Positive Plate Capacity 86 Ah, Overall Height 612 mm, Height upto Lid Top 582					
XTHF5	146	45	7.1	1.9	9.6	XTOF5	172	45	8.0	2.1	10.8
XTHF7	219	61	11.1	2.5	14.3	XTOF7	258	61	11.6	3.0	15.4
XTHF9	292	77	14.0	3.3	18.4	XTOF9	344	77	15.1	3.9	20.1
XTHF11	365	93	17.0	4.0	22.2	XTOF11	430	93	18.6	4.6	24.6
XTHF13	438	109	19.9	4.8	26.2	XTOF13	516	109	22.2	5.5	29.3
XTHF15	511	125	22.9	5.6	30.1	XTOF15	602	125	25.7	6.4	34.0
XTHF17	584	141	26.4	6.4	34.7	XTOF17	688	141	29.8	7.4	39.3
XTHF19	657	157	29.4	7.1	38.6	XTOF19	774	157	33.3	8.2	43.9
XTHF21	730	173	32.3	7.9	42.5	XTOF21	860	173	36.8	9.0	48.5
XTHF23	803	189	35.4	8.7	46.6	XTOF23	946	189	40.5	9.9	53.3
XTHF25	876	205	38.4	9.4	50.5	XTOF25	1032	205	44.0	10.8	57.9
XTHF27	949	221	41.3	10.2	54.5	XTOF27	1118	221	47.6	11.6	62.5
Cell Type	Ah @C5 at 30 Deg C	Length (mm)	Dry weight (Kg.)	Acid Volume (Ltr.)	Filled Weight (Kg.)						
Positive Plate Capacity 99 Ah, Overall Height 723 mm, Height upto Lid Top 693											
XTEF5	198	45	9.6	2.6	13.0						
XTEF7	297	61	13.8	3.6	18.5						
XTEF9	396	77	18.1	4.7	24.2						
XTEF11	495	93	22.2	5.7	29.5						
XTEF13	594	109	26.4	6.8	35.2						
XTEF15	693	125	30.6	7.8	40.6						
XTEF17	792	141	35.5	8.9	47.1						
XTEF19	891	157	39.7	9.9	52.5						
XTEF21	990	173	43.8	11.0	58.0						
XTEF23	1089	189	48.2	12.0	63.7						
XTEF25	1188	205	52.4	13.1	69.2						
XTEF27	1287	221	56.6	14.1	74.7						

## Inter Cell Connectors and Take-Offs:

### BS Bolt-on Connectors

**BS BOLT-ON CONNECTOR CROSS SECTION AREA mm<sup>2</sup>**

	EXXVF	EXIMF	EXILF	EXTLF	EXTHF	EXTOF	ELXTEF	EXTEF
5 PLATE	25	25	25	25	25	25	25	25
7 PLATE	25	25	25	25	25	25	25	35
9 PLATE	25	25	25	25	25	35	35	35
11 PLATE	25	25	25	35	35	35	35	50
13 PLATE	25	25	35	35	35	50	50	50
15 PLATE	25	25	35	35	50	50	50	70
17 PLATE	25	35	35	50	50	50	70	70
19 PLATE	25	35	35	50	50	70	70	70
21 PLATE	35	35	50	50	50	70	70	95
23 PLATE	35	35	50	50	70	70	95	95
25 PLATE	35	50	50	70	70	95	95	120
27 PLATE	35	50	50	70	70	95	120	120

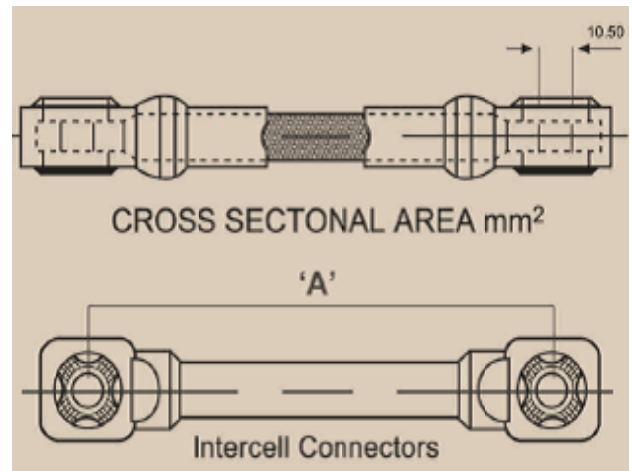


**BS TAKE-OFF CONNECTORS CATALOGUE NUMBER**

take-off	cable length 'B' mm	cross-section area				
		35 mm <sup>2</sup>	50 mm <sup>2</sup>	70 mm <sup>2</sup>	95 mm <sup>2</sup>	120 mm <sup>2</sup>
5-21 PLATE (s/p)	2000	TCL001	TCL002	TCL003	TCL004	TCL005
23-27 PLATE (d/p)	2000	Not Reqd.	Not Reqd.	TCL006	TCL007	TCL008

**BS BOLT-ON CONNECTORS CATALOGUE NUMBER**

cell type	centre distance 'A' mm	cross-section area				
		35 mm <sup>2</sup>	50 mm <sup>2</sup>	70 mm <sup>2</sup>	95 mm <sup>2</sup>	120 mm <sup>2</sup>
5 PLATE F-F	95	CCL1363	CCL1379	CCL1395	CCL1438	CCL1454
7 PLATE F-F	95	CCL1363	CCL1379	CCL1395	CCL1438	CCL1454
9 PLATE F-F	95	CCL1363	CCL1379	CCL1395	CCL1438	CCL1454
11 PLATE F-F	110	CCL1364	CCL1380	CCL1396	CCL1439	CCL1455
13 PLATE F-F	130	CCL1365	CCL1381	CCL1397	CCL1440	CCL1456
15 PLATE F-F	150	CCL1366	CCL1382	CCL1398	CCL1441	CCL1457
17 PLATE F-F (s/p)	170	CCL1367	CCL1383	CCL1399	CCL1442	CCL1458
19 PLATE F-F (s/p)	170	CCL1367	CCL1383	CCL1399	CCL1442	CCL1458
21 PLATE F-F (s/p)	195	CCL1507	CCL1508	CCL1509	CCL1510	CCL1511
23 PLATE F-F (d/p)	130	CCL1365	CCL1381	CCL1397	CCL1440	CCL1456
	300	CCL1373	CCL1389	CCL1405	CCL1448	CCL1464
25 PLATE F-F (d/p)	150	CCL1366	CCL1382	CCL1398	CCL1441	CCL1457
	300	CCL1373	CCL1389	CCL1405	CCL1448	CCL1464
27 PLATE F-F (d/p)	170	CCL1367	CCL1383	CCL1399	CCL1442	CCL1458
	325	CCL1374	CCL1390	CCL1406	CCL1449	CCL1465
E-E 5-27 PLATE	95	CCL1363	CCL1379	CCL1395	CCL1438	CCL1454



### DIN BOLT-ON CONNECTOR CROSS SECTION AREA mm<sup>2</sup>

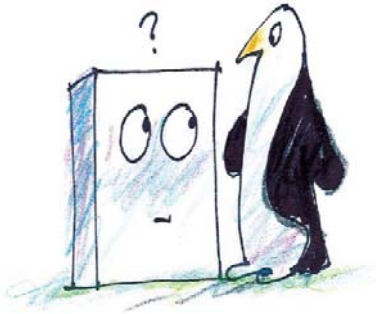
	ELXWAF	EXWAF	EXWBF	EXWCF	EHXWCF	ELXWEF	EXWEF	ELXWFF	EXWFF
5 PLATE	25	25	25	25	25	25	25	25	35
7 PLATE	25	25	25	25	35	35	35	35	35
9 PLATE	25	25	35	35	35	35	35	50	50
11 PLATE	25	25	35	35	50	50	50	50	70
13 PLATE	25	35	35	50	50	50	50	70	70
15 PLATE	35	35	50	50	50	70	70	70	95
17 PLATE	35	35	50	50	70	70	70	95	95
19 PLATE	35	50	50	70	70	95	95	120	120
21 PLATE	35	50	70	70	95	95	95	120	120

### DIN BOLT-ON CONNECTORS CATALOGUE NUMBER

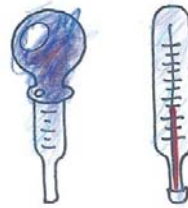
cell type	centre distance 'A' mm	cross-section area					
		25 mm <sup>2</sup>	35 mm <sup>2</sup>	50 mm <sup>2</sup>	70 mm <sup>2</sup>	95 mm <sup>2</sup>	120 mm <sup>2</sup>
5 PLATE F-F	95	CCL1347	CCL1363	CCL1379	CCL1395	CCL1438	CCL1454
7 PLATE F-F	95	CCL1347	CCL1363	CCL1379	CCL1395	CCL1438	CCL1454
9 PLATE F-F	95	CCL1347	CCL1363	CCL1379	CCL1395	CCL1438	CCL1454
11 PLATE F-F	110	CCL1348	CCL1364	CCL1380	CCL1396	CCL1439	CCL1455
13 PLATE F-F	130	CCL1349	CCL1365	CCL1381	CCL1397	CCL1440	CCL1456
15 PLATE F-F	150	CCL1350	CCL1366	CCL1382	CCL1398	CCL1441	CCL1457
17 PLATE F-F	170	CCL1351	CCL1367	CCL1383	CCL1399	CCL1442	CCL1458
19 PLATE F-F	190	CCL1352	CCL1368	CCL1384	CCL1400	CCL1443	CCL1459
21 PLATE F-F	200	CCL1353	CCL1369	CCL1385	CCL1401	CCL1444	CCL1460
E-E 5-21 PLATE	110	CCL1348	CCL1364	CCL1380	CCL1396	CCL1439	CCL1455

## Cold Stores

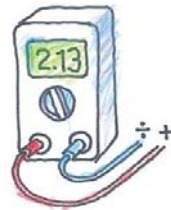
The battery capacity decreases with fall in temperature and increases with rise in temperature.



The effect of the temperature on capacity:	
Acid temperature	Battery capacity
+30°C	100%
+20°C	95%
+10°C	90%
0°C	80%
-10°C	70%
-20°C	50%
-30°C	35%



Temp.	Density	Volt
0°C	1,31	2,15
15°C	1,30	2,14
30°C	1,29	2,13
45°C	1,28	2,12



## Measuring SOC with Electrolyte Specific Gravity

%SOC (Stage of Charge)	Specific Gravity	Freezing Point of Electrolyte (Degrees Celsius)
100%	1.280	-70
75%	1.250	-52
50%	1.220	-35
25%	1.160	-17
10%	1.130	-12



## Automated Watering System

The automated water refill system makes it possible to top up all the cells from one central point through an integrated system. The vent plugs automatically ensure the optimum filling level and also allow the measurement of electrolyte specific gravity. The kit can be fitted at the factory and on site.

*Refer Automated Filling System Guide for details.*



## Battery Monitoring System

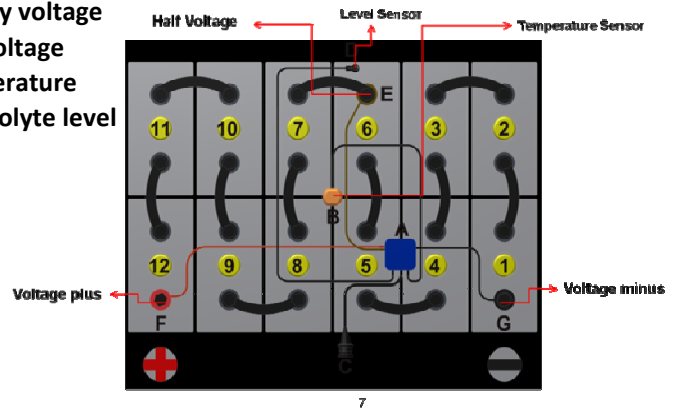
### MEASURES



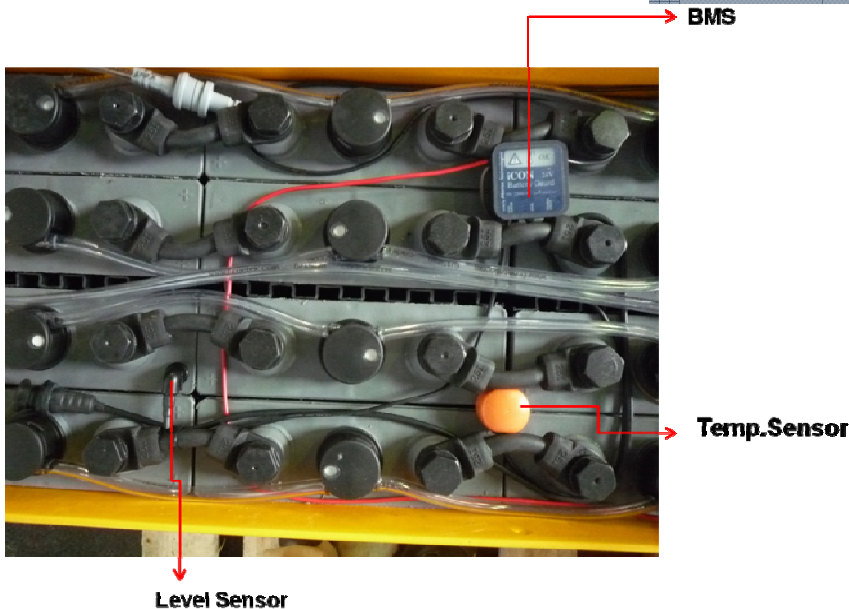
- Battery voltage
- Half voltage
- Temperature
- Electrolyte level

### STORES

- Full and half voltages
- Charge / discharge cycles
- Temperature
- Electrolyte level
- Deep discharge



Typical Installation of BMS



Level Sensor

Typical Installation of BMS

*Refer BMS and BMU Guide for details.*

## **MOTIVE POWER BATTERY**

### **INSTALLATION INSTRUCTIONS of WET CHARGED CELLS**

## Rating Data

- Nominal Capacity C5: See Plate Type for Details. \* will be reached within first 10 cycles
- Nominal Voltage: 2.0V x No. of cells
- Discharge Current: C5/5h
- Nominal Specific Gravity of the Electrolyte (PzS and PzB): 1.290 g/cc
- Rated temperature: 30°C.

## Handling of Assembled Batteries

Motive Power batteries are heavy, so adequate mechanical handling systems are to be used. Care is to be taken to ensure the sulphuric acid electrolyte is not spilled and the cells are not physically damaged.

### Precautions:

- When lifting always keep the batteries upright.
- Provided in the battery trays (container) are holes into which lifting hooks should be located.
- Ensure the battery is located in its correct position on the vehicle and secure any restraining devices.

## Unpacking of Battery Assembly of Loose cells

### i. Unpacking:

When unpacking the wooden packing case of loose cells should be kept upright and vertical. Clean off the packing material and examine for any transit damage. It is important that any damage be reported to the carrier and the agent of the Company notified that this has been done.

### ii. Assembly:

Arrange the cells as per the layout. Put packing material at all sides for adequate tightness. Connect the cells as per the layout using connectors and take-offs which are supplied with the consignment or recommended by Exide Industries Ltd. Weld the connectors using the burning ring in case of welded cells. Avoid lead run and ensure proper fusion. Use a 25Nm torque range to fasten the connectors and take-off for bolt-on cells.

#### *Weld Specifications:*

*Lead cast connectors are generally welded by the oxy-acetylene gas with the help of lead burning sticks which are supplied by us. Following are the parameter to be maintained during the operation.*

*(a) Oxygen pressure: 1.5 to 2 bar*

*(b) Acetylene pressure: 0.9 to 1.1 bar*

*(c) Nozzle size: 06*

*(d) Height of the joint: 1 to 1.5 mm*

#### **Do's and Dont's:**

- *Check layout before welding or fastening.*
- *Remove the vent cap before starting welding.*
- *Use Hand Gloves. Nose mask, goggles etc during welding.*

# PUTTING INTO SERVICE

## a) Preparing the cells

- To assure a new battery is ready for service, you should give it a three to four hour boost charge before installing it in a vehicle.
  - Boost Charge or Freshening Charge: @6% current of Rated C5 for 3-4 hours.
  - Check Specific Gravity after charge and adjust if required.
- Before charging, the electrolyte level of each cell should be between the high and low levels shown in Figure and should be about the same in each cell.
- Differences in electrolyte level can be adjusted by removing electrolyte from high-level cells and adding it to low-level cells.
- Add water to cells before *charge only if the electrolyte level is below the separator level* else never add water to cells until it is fully charged. Charging raises electrolyte levels in all cells, so adding water *before charging* can cause a potentially hazardous overflow.
- After the new battery has been on charge for one hour, check the specific gravity of the electrolyte in a selected cell and the voltage between the positive and negative terminals of the battery. Record the values. Continue charging for another hour and check these values again, repeating the above procedure. When the specific gravity of the selected cells and the overall voltage of the battery stop charging over a three hour period.
- Check the specific gravities and temperature of the cells and adjust the specific gravity .
- It is recommended that before the battery is put to use, it may be discharged once at 5hour rate and recharged back using the same constant current schedule.

## b) Correction of Specific Gravity of the Electrolyte

- If at the end of freshening charge, the specific gravity of the electrolyte is below 1.270 after voltage and specific gravities have remain constant for 2 to 3 hrs, withdraw some of the electrolyte and add acid of 1.350 to 1.400 specific gravity, continuing the charge meantime.
- If the Specific Gravity is above 1.285 at 30Deg Celsius, correct using Distilled Battery Grade Water.
- If the Specific Gravity is between 1.270 and service gravity adjusts the specific gravity after few cycles of usage.
- Thereafter the vent plugs are then firmly secured in their place on the cell lids and battery is thoroughly washed with copious amounts of fresh water to remove all traces of acid from all sides.
- Smear the terminals with Anti Corrosive Grease before the cable ends are connected to them.

## c) Fitting on vehicle

- Wipe the top of the battery clean and dry. All bolted connections to battery terminals should be smeared with appropriate [Anti-Corrosive Grease](#) and then tightened up.
- Connecting cables should be well anchored and sufficiently long to prevent pulling on battery terminals. The cells must be accessible to facilitate testing and topping-up.

## **MOTIVE POWER BATTERY**

### **INSTALLATION INSTRUCTIONS of DRY PRECHARGED CELLS**

## Rating Data

- Nominal Capacity C5: See Plate Type for Details. \* will be reached within first 10 cycles
- Nominal Voltage: 2.0V x No. of cells
- Discharge Current: C5/5h
- Nominal Specific Gravity of the Electrolyte (PzS and PzB): 1.290 g/cc
- Rated temperature: 30°C.

## Handling of Assembled Batteries

Motive Power batteries are heavy, so adequate mechanical handling systems are to be used. Care is to be taken to ensure the sulphuric acid electrolyte is not spilled and the cells are not physically damaged.

### Precautions:

- When lifting always keep the batteries upright.
- Provided in the battery trays (container) are holes into which lifting hooks should be located.
- Ensure the battery is located in its correct position on the vehicle and secure any restraining devices.

## Unpacking & Battery Assembly of Loose cells

### iii. Unpacking:

When unpacking the wooden packing case of loose cells should be kept upright and vertical. Clean off the packing material and examine for any transit damage. It is important that any damage be reported to the carrier and the agent of the Company notified that this has been done.

### iv. Assembly:

Arrange the cells as per the layout. Put packing material at all sides for adequate tightness. Connect the cells as per the layout using connectors and take-offs which are supplied with the consignment or recommended by Exide Industries Ltd. Weld the connectors using the burning ring in case of welded cells. Avoid lead run and ensure proper fusion. Use a 25Nm torque range to fasten the connectors and take-off for bolt-on cells.

#### *Weld Specifications:*

*Lead cast connectors are generally welded by the oxy-acetylene gas with the help of lead burning sticks which are supplied by us. Following are the parameter to be maintained during the operation.*

*(a) Oxygen pressure: 1.5 to 2 bar*

*(b) Acetylene pressure: 0.9 to 1.1 bar*

*(c) Nozzle size: 06*

*(d) Height of the joint: 1 to 1.5 mm*

#### **Do's and Dont's:**

- *Check layout before welding or fastening.*
- *Remove the vent cap before starting welding.*
- *Use Hand Gloves. Nose mask, goggles etc during welding.*

# First Charge for Dry Uncharged Cells

## Requirements.

### i. a) Charger

Initial Charging is to be commenced only by using a constant current charger and the Charging rate is to be kept at 6% or 12% of the Rated Ampere of the battery.

### b) Hydrometer

### c) Thermometer (preferably alcohol type)

### d) Voltmeter

### ii. Acid Specifications.

Cells should be filled with battery grade Sulphuric acid of 1.260 +/- 0.005 specific gravity at 30 deg C and should conform to the Specifications below.

*Iron ( as Fe ) percent by mass* : 0.001 ( Max)

*Chlorides ( as Cl ) percent by mass* : 0.0003 ( Max)

### iii. Water Specifications.

While Mixing or Diluting acid, only battery grade water should be used and should conform to the specifications below:

*pH level* : 6.5 – 7.5

*Heavy metals ( as Pb )mg/l* : 0.1 (max)

*Iron & manganese mg/l* : 0.1 ( max)

*Specific electrical conductivity*

*At 25 °C in dionic units* : 5 ( max )

## ACID FILLING

- i. Fill all cells with cool (room temperature) dilute battery grade sulphuric acid up to requisite level (bottom of basket).
- ii. After the cells are filled up, polarity check has to be carried out using a Voltmeter on all cells. This is to ensure that the terminals of all cells are connected properly. If any cell is wrongly / reversely connected, it has to be disconnected from the battery and reconnected correctly.
- iii. Allow sufficient rest/soaking time to enable the plates to soak in acid in their pores and allow the temperature to come down. The soaking period may vary between 12 hours to 24 hours for Dry Uncharged cells.
- iv. After soaking the level of electrolyte will fall and has to be restored by topping up of acid of same specific gravity as in initial filling.
- v. After soaking period is over, the battery has to be connected to the battery charger and commence the initial Charging.

## CHARGING INSTRUCTION

- i. Initial Charging is to be commenced using a Constant Current Charger with the Constant Current rate mentioned in the catalogue or at 6% of the Rated C5 Ampere Hour alternatively at 12% till 2.36 vpc and at 6% till end of charge ensuring the minimum input of 5 to 5.5 times of rated C5 capacity.
- ii. Once the Initial Charging commences, periodic readings of cell voltage, cell specific gravity and temperature are to be obtained from all cells. This has to be done at least once in four hours.

## CHARGE TERMINATION CRITERIA

Initial Charging is complete only when all the following criteria are met:

- i. The Voltage of all cells rise up to 2.70/2.75 volts per cell and remains constant during four consecutive hourly readings.
- ii. The Specific Gravity of all cells rises to the maximum level (1.285-1.290) and remains constant during 4 consecutive hourly readings.
- iii. Input of 5 to 5.5 times the Rated Ah is complete.

### Do's and Dont's:

The charge may be given continuously or in cycles of not less than 8 hrs charge and not more than 16 hrs rest, until it is completed.

## PUTTING INTO SERVICE

- i. If at the end of first charge, the specific gravity of the electrolyte exceeds 1.290, withdraw some electrolyte and add battery grade water, continue the charge so that the water and acid are thoroughly mixed.
- ii. If at the end of first charge, the specific gravity of the electrolyte is below 1.270 after voltage and specific gravities have remain constant for 2 to 3 hrs, withdraw some of the electrolyte and add acid of 1.350 to 1400 specific gravity, continuing the charge meantime.
- iii. If the Specific Gravity is between 1.270 and service gravity adjusts the specific gravity after few cycles of usage.
- iv. Thereafter the vent plugs are then firmly secured in their place on the cell lids and battery is thoroughly washed with copious amounts of fresh water to remove all traces of acid from all sides.
- v. Smear the terminals with Petroleum Jelly before the cable ends are connected to them.
- vi. It is recommended that before the battery is put to use, it may be discharged once at % hour rate and recharged back using the same constant current schedule.



## **MOTIVE POWER BATTERY**

### Operation and Maintenance of Motive Power Cells

# OPERATION and MAINTENANCE

## a) General

- It is recommended that the battery is not discharged beyond 80% of nominal capacity. When the battery has been discharged it should be recharged as soon as possible on the appropriate charger. Open the battery compartment to get additional ventilation during a charge. Leave the vent plugs firmly in position.

- A battery is ready for operation after it is properly charged.
- Batteries must be put on recharge immediately after discharge.
- Recharging to be done with *Recommended Traction Taper Chargers Only*.
- Carry out *Equalizing Charge* once every 2 weeks if the battery is worked heavily (80% DOD). If the battery is discharged up to 50% everyday, equalizing charge can be carried out once in 4 weeks.
- Keep battery top clean and dry. Check earth leakage and if the leakage voltage is more than 7-8 percent of battery voltage, thoroughly wash the battery and dry it.
- Water Topping-Up with battery grade water has to be done on a regular basis.

## b) Methods of Recharging:

Taper Charging or Constant Current followed by Taper Charger: it is important that the output of the charger is matched to the capacity of the battery.

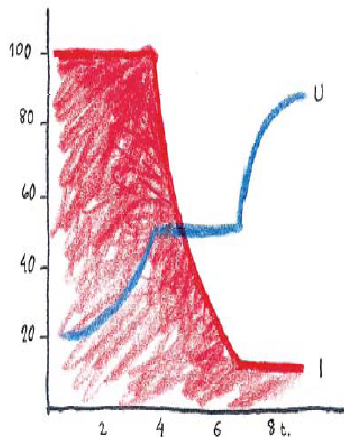
Typical IUI Recharge:

Step1-@15% of Rated C5 till 2.35 vpc

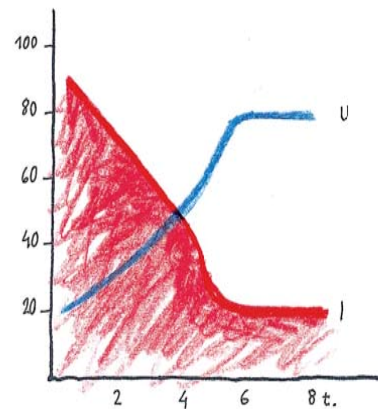
Step2- Constant Volt @2.35vpc till the Current tapers to 7-8% of C5

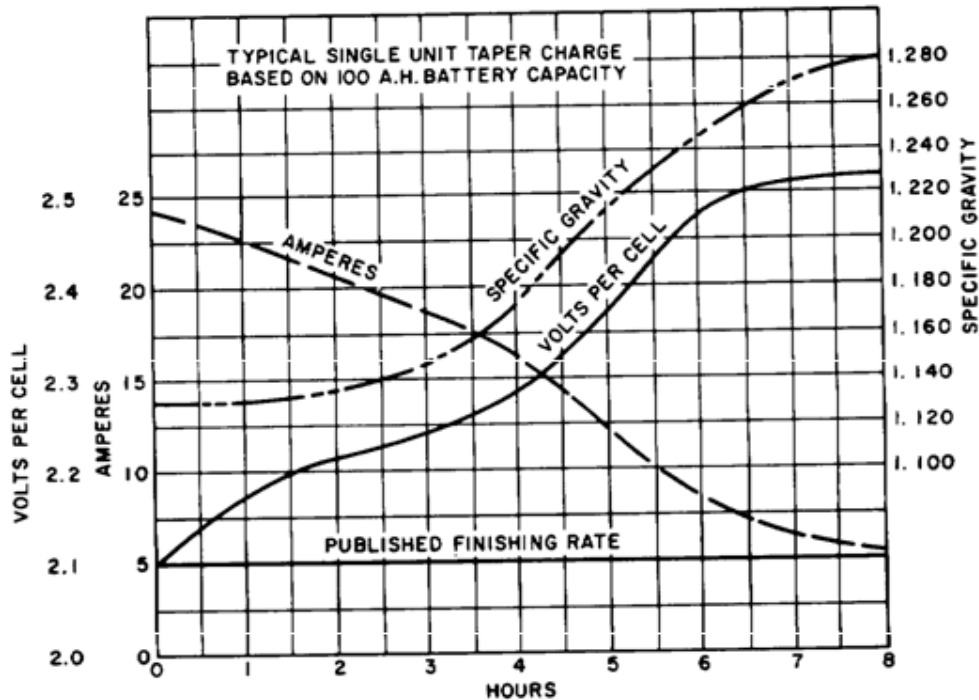
Step3- @ 7-8% of C5 till the Specific Gravity rise becomes constant

IUI charge characteristic



W charge characteristic





[A Typical Single Step 8-Hour Taper Charge \(W Charge\)](#)

### c) Equalizing Charge

Traction cells over a period of use develop unequal state of charge (unequal specific gravities) and needs to be equalized from time to time. If this state of inequality is allowed to continue, the battery loses effective capacity, the weakest cell capacity being the deciding factor for battery capacity.

#### Procedure:

- i. Connect the battery to a charger and commence charging at 3% of battery capacity in Amperes. The current has to be kept constant throughout the charging process.
- ii. Top Up all cells up to requisite level with DM water.
- iii. Take hourly readings of specific gravity, voltage and temperature.
- iv. Equalizing charge to be continued till.
  - a. Voltage of all cells on charge, reach a maximum level and remain constant for 3 consecutive hourly readings.
  - b. Specific gravity of all cells reaches a maximum level and remain constant for 3 consecutive hourly readings.

#### d) Opportunity Charge

Guidelines for opportunity charging

3 key factors affect the usefulness of opportunity charging:

- The time spent on opportunity charging.
  - Longer periods of approximately 1 hour are preferred – short periods of 5 minutes deliver little benefit.
- The current battery capacity at the time of commencing the opportunity charge.
  - The benefit of opportunity charging is maximized if the battery is already over 25% discharged.
- The recharge time of the charger used.
  - 8 hour chargers will return energy more quickly to the battery.

The table below details the typical affect of 1 hour opportunity recharge in relation to the depth of discharge of the battery and the charger sizing:

Battery capacity at commencement of opportunity	Approximate percentage of battery capacity returned during 1 hour of opportunity charging	
	Typical 8 hour charger	Typical 12 hour charger
95%	6.5%	5.5%
85%	9.0%	7.5%
75%	13%	9.0%
65%	13%	9.0%
50%	13%	9.0%
25%	13%	9.0%

#### Important

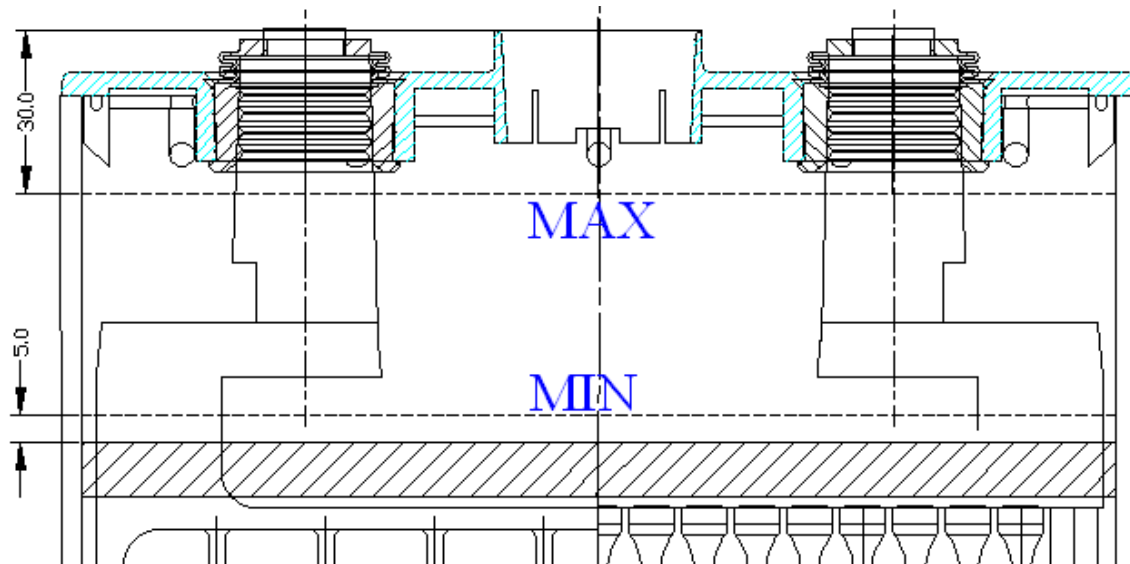
Always remember to switch the charger off or press the pause button each time the battery is disconnected from or connected to the charger. This avoids sparking.

### e) Cleaning

The top of the battery should be kept clean and dry. Keep the vent caps in place during use and charging. Remove the vent cap only to observe electrolyte levels, make water additions, take temperatures, or take specific gravity readings with a hydrometer. The solution used to clean and neutralize the outside of the batteries should be disposed of in an environmentally safe manner.

### f) Water Additions

Maintain electrolyte levels above the plate separators, but no higher than 5mm from the bottom of the vent well. Check the electrolyte level monthly, or as necessary depending on battery use prior to charging. If the level is below the plate separators, add just enough water to cover them and then proceed with charging the battery. Otherwise, defer watering the battery until the end of the charging period when the battery is fully charged and the charger has tapered to its finish rate. At that time, add enough water to bring the electrolyte level to 30mm of the top of the cover. Always use distilled water or water that is known to be free of abnormally high amounts of impurities.



#### Do's and Dont's:

- Make sure that the battery is disconnected from all charging equipment
- Make sure that the battery is properly cleaned.
- Make sure that you are working with safety glasses.

# Rectification of Corroded Bolt-On Terminal



1



2



3



4



5



6

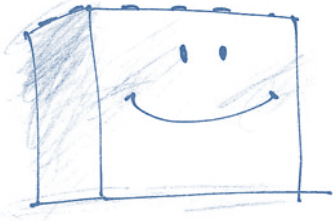


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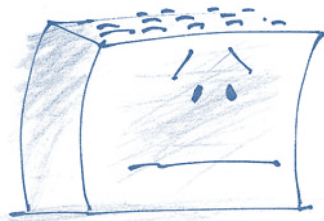
## Procedures

- 1) Remove Washer
- 2) Use a Milling Cutter to grind the corroded part.
- 3) Lubricate Thoroughly
- 4) Fasten connectors tightly

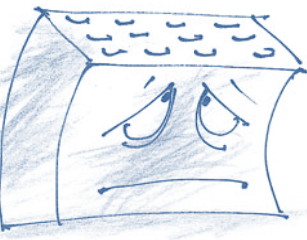
## Storage



A battery that is not used for a while must be fully charged when it is stored. Check specific gravities monthly and give a Freshening Charge if the gravities have fallen 0.030 points or more.



Normally a battery will have a 5-7% self-discharge per month, depending on the battery's age



If a battery is supplied dry, ensure the protective cap is closed to protect the negative plate from oxidation. Store in a cool and dry place away from rain or snow. Do not store for more than two years.

### Effect of Temperature on Self Discharge

Temperature (Degrees Celsius)	Drop in Specific Gravity /Day
50	0.004 points
38	0.003 points
27	0.001 points
10	0.0005 points

## Trouble Shooting

If promptly and properly detected, evaluated and corrected, problems that develop in lead-acid batteries can be resolved, assuring optimum service and full expected life. The following table will help you identify improper battery conditions, their probable causes and recommended corrective actions. Contact Exide Industries Service personnel for further assistance.

Condition	Probable cause	Corrective action
<b>Excessive watering required</b>	1. Overcharging	a. Use a properly sized charger b. Decrease charging time c. Do not put battery on charge at end of shift if specific gravity is equal to or above 1.270
<b>Unequal or low specific gravities</b>	1. Loss of electrolyte due to overwatering or watering before charge is completed 2. Incomplete charge 3. Stratified electrolyte 4. Charger malfunction	a. Give equalizing charge and obtain help from an service office b. Give equalizing charge c. Give equalizing charge d. Contact service office
<b>Low cell voltages</b>	1. Low specific gravity 2. Short circuit 3. Voltage leak between cells or tray	a. Give equalizing charge b. Clear short or replace cell c. Clean battery top
<b>excessive cell temperatures</b>	1. Weak or defective cell 2. Charger too large for the battery 3. Low electrolyte level 4. Short circuit 5. Insufficient air circulation around battery on charge 6. Inadequate cooling time 7. Overdischarge	a. Repair or replace cell b. Use properly sized charger c. Water cell after battery is fully charged d. Clear short or replace cell e. Reduce charging room temperature and increase ventilation f. Allow at least 8 hrs. cooling after charge g. Limit discharge to 80% of rating



<b>Incomplete shift operation</b>	1. Undersized battery	a. Replace with battery of greater capacity
	2. Undercharged battery	b. Check charger and charge termination devices; extend charging time
	3. Defective cell(s)	c. Replace cell(s)
	4. Defective cable or connector	d. Replace defective parts <ul style="list-style-type: none"> <li>• Check connector for mechanical damage</li> <li>• Check contacts for secure crimp-contact to cable</li> <li>• Check contacts for pitting</li> </ul>

## CAUTION

### UNDERCHARGING

Undercharging over a period of time is one of the most destructive forms of abuse to which a battery can be subjected. The formation of excessive amounts of lead sulphate causes the positive plates to expand and break up while the negative active material harden and lose capacity. The best protection against undercharging is a regular check on the specific gravity readings of the battery after the normal recharge has been completed. If readings show consistent undercharging, remedial action must be taken.

### OVERCHARGING

Overcharging is another form of abuse that can have a serious effect on battery life; its effects are not as immediately obvious as those of under charging. It is, therefore, important to check battery voltage and charge current from the charger's ammeter, and compare it with the recommended rate.

Overcharging due to excessively high charging rates or charging for too long a period produces over-gassing, high temperatures and corrosion of the positive spine. These all result in shedding of active materials and greater water loss.

### OVERDISCHARGING

If undercharging is combined with over discharging the effects are intensified. Strictly speaking, a battery is not over discharged at any rate unless more than its capacity at that rate has been taken out. Nevertheless, it is highly undesirable to take out anything approaching 100% of its rated capacity on a regular basis.

A battery should not normally be discharged more than 80% of its capacity. The specific gravity of the electrolyte reflects relatively accurately how many ampere-hours have been taken from a cell on discharge. If the battery is grossly over discharged the temperature will rise dramatically in the latter stages. The battery should be allowed to cool before recharge

# **Technology behind Maintenance Free Motive Power**

# EXIDE MOTIVE POWER GEL PzV

## Technical specification for traction GEL - cells

### 1. Application

**PzV** - Batteries are maintenance-free and designed for a high cycle life and a high operational safety.

**PzV** - Batteries are ideal for Motive Power applications

- Where no maintenance people are available,
- Where charging should be made outside of charging stations between the goods,
- Where sensible goods like fresh food are transported.

### 2. Design

- **Positive plate:** Robust Tubular Plate
- **Alloy:** PbCaSn Alloy free from (Cadmium and Antimony)
- **Electrolyte:** Gelled Electrolyte
- **Pole bushing:** 100 % acid and gas tight
- **Poles:** With brass insert and thread M10 female
- **Connectors:** Bolt-on flexible, fully insulated intercell and terminal connectors
- **Valve:** With optimized opening pressure and with backfire barrier



### 3. Operation

- Operational temperature: -10 °C to +45 °C Regular
- Discharges: Up to 60 %
- Final charging current: Maximum 1.6 A/100 Ah C<sub>5</sub> h
- Self discharge: Less than 2 % per month
- No topping up during the whole life.
- No electrolyte spilling from the battery.
- Reduced ventilation requirements.



## 4. Charging regime with IUI

$t_1$ : Initial current:  $I_1 = 15.20$  A per 100 Ah  $C_{5h}$

$t_2$ : Charging at 2.4 V per cell, current reduction to  $I_2$

$t_3$ : Gas charging with  $I_2 = 1.2$  A to 1.6 A per 100 Ah  $C_{5h}$

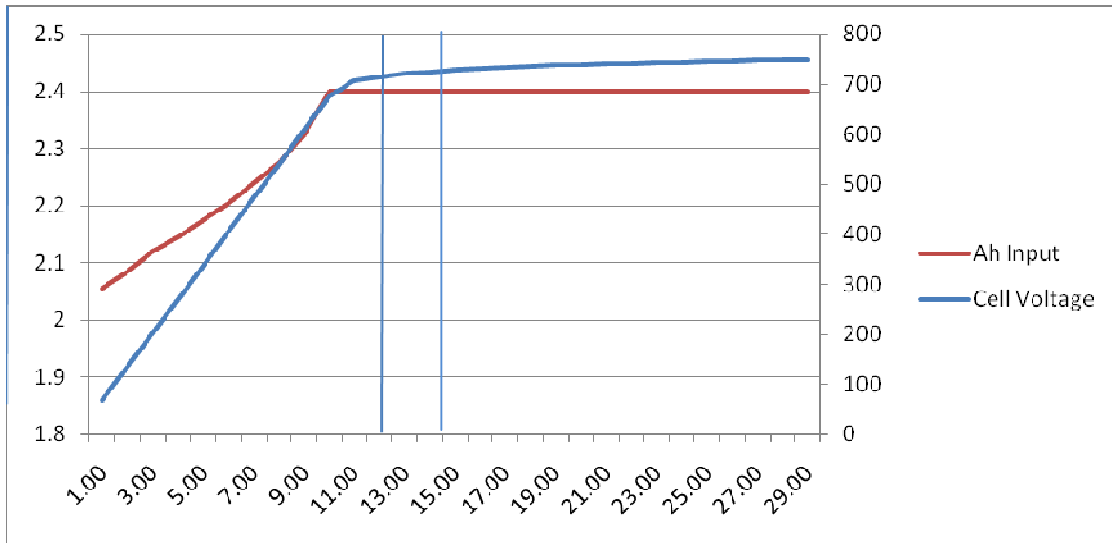
$t_1$ ,  $t_2$  and  $t_3$  are time intervals of charging steps.

$(t_1 + t_2)$  is set of maximum 10 h for safety reasons,  
 $t_3$  should be equal to  $(t_1 + t_2)$ , but at least 1 h and maximum 4h.

**Warning:**

If higher Charging Currents are used (during  $t_3$ ), the cells will dry out.

### Typical Constant Potential Recharge @2.4 volts per cell from 100% DOD level



At 12 Hours the Recharge factor is 1.05

At 15 Hours the Recharge factor is 1.07

For Better performance of the battery the Recharge factor should be in the range of 1.05-1.07.

## 5. Using the charging Regime acc to point 4 and maintaining the EIL operating Guidelines, following cycle life can be expected.

- 20% DOD-----3000 Cycles
- 40% DOD-----1500 Cycles
- 60% DOD-----1000 Cycles
- 80% DOD-----800 Cycles

BS Traction Gel				
Plate Type	Overall Ht.	Dimensions		
		L	W	H (Upto Lid Top)
2PzVB44	290	45	158	260
3PzVB66	290	61	158	260
4PzVB88	290	77	158	260
5PzVB110	290	93	158	260
6PzVB132	290	109	158	260
7PzVB154	290	125	158	260
8PzVB176	290	141	158	260
9PzVB198	290	157	158	260
10PzVB220	290	173	158	260
2PzVB60	369	45	158	339
3PzVB90	369	61	158	339
4PzVB120	369	77	158	339
5PzVB150	369	93	158	339
6PzVB180	369	109	158	339
7PzVB210	369	125	158	339
8PzVB240	369	141	158	339
9PzVB270	369	157	158	339
10PzVB300	369	173	158	339
2PzVB74	437	45	158	407
3PzVB111	437	61	158	407
4PzVB148	437	77	158	407
5PzVB185	437	93	158	407
6PzVB222	437	109	158	407
7PzVB259	437	125	158	407
8PzVB296	437	141	158	407
9PzVB333	437	157	158	407
10PzVB370	437	173	158	407
2PzVB86	488	45	158	458
3PzVB129	488	61	158	458
4PzVB172	488	77	158	458
5PzVB215	488	93	158	458
6PzVB258	488	109	158	458
7PzVB301	488	125	158	458
8PzVB344	488	141	158	458
9PzVB387	488	157	158	458
10PzVB430	488	173	158	458

BS Traction Gel				
Plate Type	Overall Ht.	Dimensions		
		L	W	H (Upto Lid Top)
2PzVB100	544	45	158	514
3PzVB150	544	61	158	514
4PzVB200	544	//	158	514
5PzVB250	544	93	158	514
6PzVB300	544	109	158	514
7PzVB350	544	125	158	514
8PzVB400	544	141	158	514
9PzVB450	544	157	158	514
10PzVB500	544	173	158	514
2PzVB130	612	45	158	582
3PzVB195	612	61	158	582
4PzVB260	612	77	158	582
5PzVB325	612	93	158	582
6PzVB390	612	109	158	582
7PzVB455	612	125	158	582
8PzVB520	612	141	158	582
9PzVB585	612	157	158	582
10PzVB650	612	173	158	582
2PzVB140	638	45	158	608
3PzVB210	638	61	158	608
4PzVB280	638	77	158	608
5PzVB350	638	93	158	608
6PzVB420	638	109	158	608
7PzVB490	638	125	158	608
8PzVB560	638	141	158	608
9PzVB630	638	157	158	608
10PzVB700	638	173	158	608
2PzVB150	725	45	158	695
3PzVB225	725	61	158	695
4PzVB300	725	77	158	695
5PzVB375	725	93	158	695
6PzVB450	725	109	158	695
7PzVB525	725	125	158	695
8PzVB600	725	141	158	695
9PzVB675	725	157	158	695
10PzVB750	725	173	158	695

DIN Traction Gel				
Plate Type	Overall Ht.	Dimensions		
		L	W	H (Upto Lid Top)
2PzV100	370	47	198	340
3PzV150	370	65	198	340
4PzV200	370	83	198	340
5PzV250	370	101	198	340
6PzV300	370	119	198	340
7PzV350	370	137	198	340
8PzV400	370	155	198	340
9PzV450	370	173	198	340
10PzV500	370	191	198	340
2PzV134	435	47	198	405
3PzV201	435	65	198	405
4PzV268	435	83	198	405
5PzV335	435	101	198	405
6PzV402	435	119	198	405
7PzV469	435	137	198	405
8PzV536	435	155	198	405
9PzV603	435	173	198	405
10PzV670	435	191	198	405
2PzV146	505	47	198	475
3PzV219	505	65	198	475
4PzV292	505	83	198	475
5PzV365	505	101	198	475
6PzV438	505	119	198	475
7PzV511	505	137	198	475
8PzV584	505	155	198	475
9PzV657	505	173	198	475
10PzV730	505	191	198	475

DIN Traction Gel				
Plate Type	Overall Ht.	Dimensions		
		L	W	H (Upto Lid Top)
2PzV180	541	47	198	511
3PzV270	541	65	198	511
4PzV360	541	83	198	511
5PzV450	541	101	198	511
6PzV540	541	119	198	511
7PzV630	541	137	198	511
8PzV720	541	155	198	511
9PzV810	541	173	198	511
10PzV900	541	191	198	511
2PzV200	600	47	198	570
3PzV300	600	65	198	570
4PzV400	600	83	198	570
5PzV500	600	101	198	570
6PzV600	600	119	198	570
7PzV700	600	137	198	570
8PzV800	600	155	198	570
9PzV900	600	173	198	570
10PzV1000	600	191	198	570
2PzV240	715	47	198	685
3PzV360	715	65	198	685
4PzV480	715	83	198	685
5PzV600	715	101	198	685
6PzV720	715	119	198	685
7PzV840	715	137	198	685
8PzV960	715	155	198	685
9PzV1080	715	173	198	685
10PzV1200	715	191	198	685



**MOTIVE POWER BATTERY**

**INSTALLATION and MAINTENANCE INSTRUCTIONS GEL**

# EXIDE MOTIVE POWER GEL PzV and PzVB

## Maintenance Guidelines

### Rating Data

- Nominal capacity C5 : See type plate
- Nominal voltage : 2.0 V x No of cells
- Discharge current : C5/5h
- Nominal S.G. of electrolyte\* Type PzV : 1.29 kg/l
- Rated temperature : 30°C

\*Will be reached within the first 10 cycles

EIL Traction Gel batteries are valve-regulated, maintenance free batteries. Unlike conventional batteries with liquid electrolyte they have immobilized electrolyte (gelled sulphuric acid). Instead of a vent plug, a valve is used to regulate the internal gas pressure, preventing the ingress of oxygen from the air and allowing the escape of excess charging gasses. When operating valve-regulated lead-acid batteries the same safety requirements as for vented cells apply, to protect against hazards from electric current, from explosion of electrolytic gas and – with some limitations – from the corrosive electrolyte. Battery valves should never be removed. **These batteries do not require topping-up with distilled or demineralized water.**

### 1. Commissioning

The Exide Motive Power Gel battery should be inspected to ensure it is in perfect physical condition. Use special coding systems for maintenance free batteries for the charging plug- and- socket devices to prevent accidental connection to a wrong type of charger. The battery end cables must have a good contact to terminals; check that the polarity is correct. Otherwise battery, vehicle or charger could be damaged. The specific torque loading for the bolts of the charger M10 cables and connectors is 25 NM.

Never directly connect an electrical appliance (for example: warning beacon) to some cells of the battery. This could lead to an imbalance of the cells during the recharge, i.e. a loss of capacity, the risk of insufficient discharge time, damage to the cells and this may EFFECT THE WARRANTY OF THE BATTERY.  
Charge before use.

### 2. Operation

Ventilation openings must not be sealed or covered. Electrical connections

condition. To achieve the optimum life for the battery, operating discharges of more than 80 % of the rated capacity must be avoided (deep discharge). They reduce the battery service life. Discharged batteries must be recharged and never be left in a discharged state for a long time.

The batteries are to be used in normal duty applications for a maximum 6 days per week.

Avoid applications where:

- No rest time is available allowing the battery to cool
- Battery duty leads to a high increase of temperature during operation.

### 3. Recharge

A full charge shall be carried out every working day. The charging time for an 80 % discharged battery shall be 12 hours, or 8 hours for a 60% discharged battery with the appropriate constant potential charger or IUI charger. Though the batteries have a low gas emission when charging, proper provision shall be made for venting of the charging gases (EN 50272-3).

#### 1. Charging regime with IUI

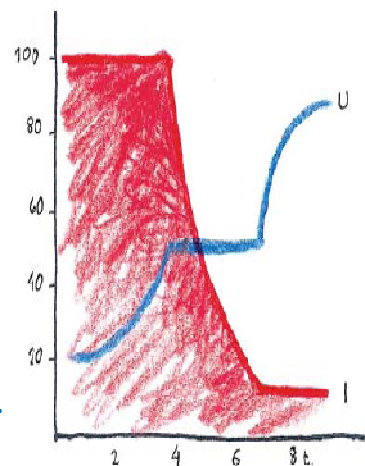
$t_1$ : Initial current:  $I_1 = 15.20 \text{ A per } 100 \text{ Ah } C_{5 \text{ h}}$

$t_2$ : Charging at 2.4 V per cell, current reduction to  $I_2$

$t_3$ : Gas charging with  $I_2 = 1.2 \text{ A to } 1.6 \text{ A per } 100 \text{ Ah } C_{5 \text{ h}}$

$t_1$ ,  $t_2$  and  $t_3$  are time intervals of charging steps.

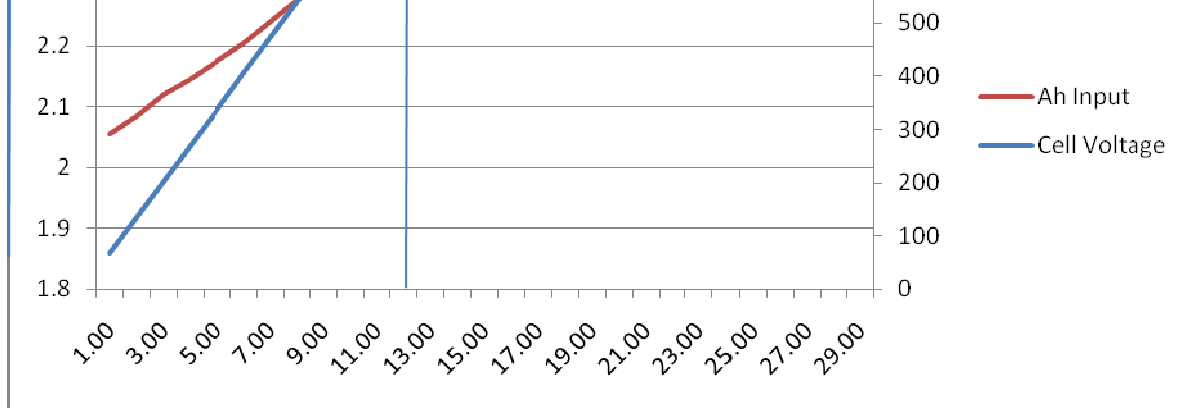
$(t_1 + t_2)$  is set of maximum 10 h for safety reasons,  
 $t_3$  should be equal to  $(t_1 + t_2)$ , but at least 1 h and maximum 4h.



**Warning:**

If higher Charging Currents are used (during  $t_3$ ), the cells will dry out.

**Typical Constant Potential Recharge @2.4 volts per cell from 100% DOD level**



At 12 Hours the Recharge factor is 1.05  
 At 15 Hours the Recharge factor is 1.07

For Better performance of the battery the Recharge factor should be in the range of 1.05-1.07.

## 4. Equalizing Charge

Equalizing charges are used to optimize the life of the battery and to maintain its capacity. A Equalization charge should be carried out weekly 8 hours after the end of the charge at 3-4% of Rated C5 Ah of the battery.

## 5. Maintenance

The electrolyte is immobilized in a gel. The density of the electrolyte cannot be measured.

- Never refill with water!
- Never remove the safety valve from the cell

In case of accidental damage of the valve, contact our Sales Service for replacement.

The battery should always be kept clean and dry to prevent current leakage. Any liquid in the battery tray shall be extracted. Damage to the insulation of the tray should be repaired after cleaning, to ensure a good insulation and to prevent tray corrosion. If it is necessary to remove cells it is best to call in our service department for this.

### • Daily

- Carry out end of charge voltage readings at C5/100, measure and record:
  - The voltage of the battery
  - The voltages of each cell

If significant changes from earlier measurements or differences between the cells or bloc batteries are found, please contact Service.

If the discharge time of the battery is not sufficient, check:

- That the work required is compatible with the battery capacity

- **Annually or Bi-annually**

Internal dust removal from the charger. Check with attention:

- The state of the plugs, be sure to have a good contact between the plugs without trace of overheating.
- The state of the output cables.

If you check the torque loading, you shall use a torque wrench with respect of recommended value : 25+/- 2 Nm. In accordance with EN 1175-1 at least once per year, the insulation resistance of the truck and the battery must be checked by an electrical specialist. The tests on the insulation resistance of the battery shall

be conducted in accordance with EN 1987 part 1. The insulation resistance of the battery thus determined must not be below a value of 50 ohm per Volt of nominal voltage, in compliance with EN 50272-3. For batteries up to 20 V nominal voltage the minimum value is 1000 ohm.

## 6. Storage

If batteries are taken out of service for a lengthy period they should be stored, disconnected from the truck, in the fully charged condition in a dry, frost-free room.

Batteries shall be recharged after a maximum storage time of:

- 2 months at 30 °C
- 3 months at 20 °C

Recharge before putting the battery into service. A monthly refreshing charge is recommended if the Open Circuit Voltage falls below 2.10 Volts per cell.

### **Freshening Charge: @ 3-4 % Current of Rated Capacity for 5 hours**

The storage time should be taken into account when considering the life of the battery. Never leave a battery connected to a truck for a long time. Storage at open circuit is not allowed when in discharged state.

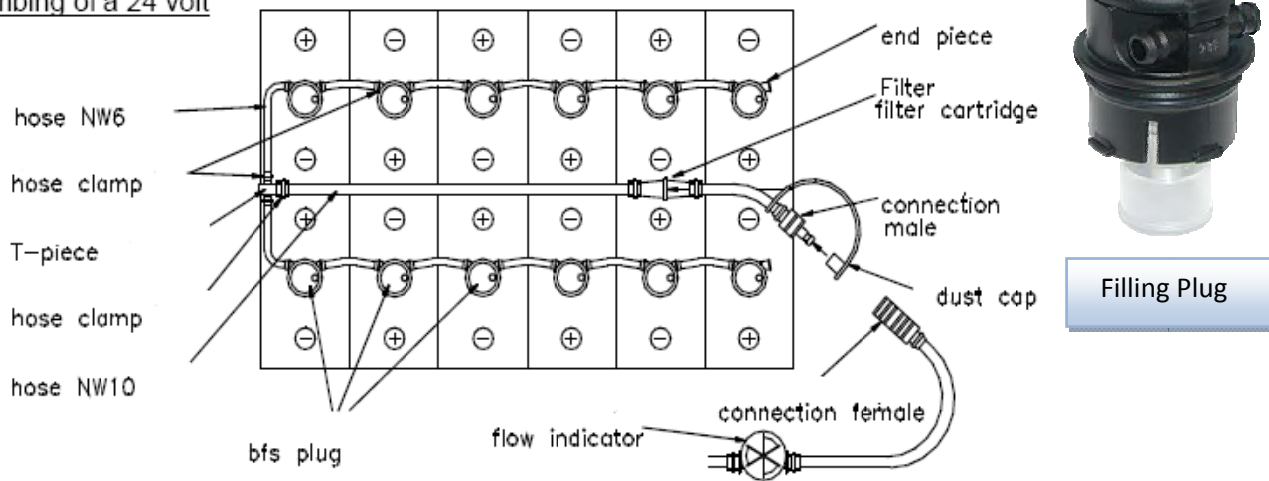


# INSTALLATION & MAINTENANCE of AUTOMATED WATER FILLING SYSTEM

## Automated Battery Filling System

Exide Industries' Motive Power Cells can have battery filling systems fitted as optional criteria. These systems allow as topping up of batteries in an efficient and trouble free manner, Electrolyte levels are easily monitored via the visual float level indicator. The automatic water refill system makes it possible to top up all the cells from one central point through an integrated system. The vent plugs automatically ensure the optimum filling level and also allow the measurement of electrolyte specific gravity. The kit can be expertly fitted at the factory and on site.

### Sample for the plumbing of a 24 volt



## Filling System Operation

Through a process of gravity the water flows out from the PVC tank, through a tap and a nozzle connected by 10mm diameter polythene pipe. The water first passes through a flow indicator. The rotating fins indicate unidirectional flow of water which basically indicates that the battery topping up is on. The filter cartridge in the system filter out all contamination in the water, thereby bringing the water up to the specified grade for topping up. The 10mm inlet pipe now bifurcates into two 6mm sub pipes, through which water is distributed as per exact requirement. Water flows sequentially through the rows of cells. The sequence is generally applicable whether the battery is 24, 36, 48 volts or higher. The 6 mm pipe terminates at the end pit to avert spillage.

## Why Automated Battery Filling System?

1. **Filling system ensures accurate and timely topping up with no “Under-watering”.**

Water is lost from the electrolyte primarily through evaporation and electrolysis (gassing) during charging. Due to this water loss there is a chance of the plate being exposed to air, which in turn over a period of time shall lead to hard sulphate formation on the plate, reducing life and capacity.

2. **Filling system ensures accurate topping up with no “Over-watering”.**

When a battery is over filled, it leads to loss of electrolyte because of over flow and also, dilution of electrolyte which may develop a leakage path between connectors and ground and messy battery top.

## Advantages

- 100% absence of manual labour eliminates human error
- No chance of contamination.
- 20% increase in battery life.
- Finally, the filling system makes a battery system totally maintenance free in terms of water topping up.



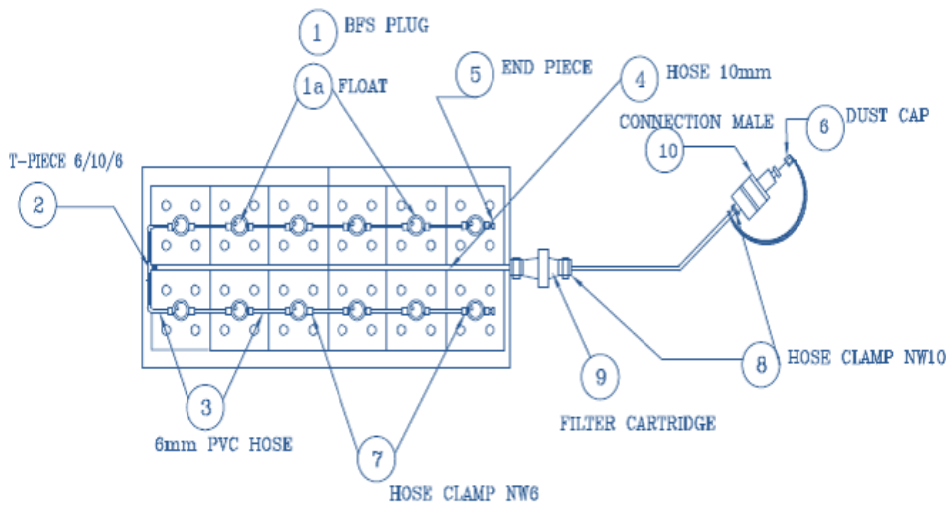
Filling System with Exide Tractor Battery

## Installation of Battery Filling System

Bill of Material of Automated Watering System							
Sl. No.	Material Code	Material Description	BOM	BOM	BOM	BOM	BOM
			24 V TRACT (12 CELLS)	30V TRACT (15 CELLS)	36 V TRACT (18 CELLS)	48 V TRACT (24 CELLS)	72 V TRACT (36 CELLS)
1	13C701553002	FILTER CARTRIDGE-IMPORTED(AUTOFIL)	1	1	1	1	1
2	13C701764002	FLOW INDICATOR 09FL11.(FOR AUTOFIL)	1	1	1	1	1
3	13C701554002	CONNECTION-MALE(NW10)(AUTOFIL)	1	1	1	1	1
4	13C701555002	CONNECTION-FEMALE(NW10)(AUTOFIL)	1	1	1	1	1
5	13C701557002	HOSE CLAMP NW10(AUTOFIL)	12	12	12	14	14
6	13C701556002	HOSE CLAMP NW6 (AUTOFIL)	35	42	50	62	86
7	13C701559002	DUSTCAP "C"(AUTOFIL)	1	1	1	1	1
8	13C707001002	PUSH IN PLUG FOR AUTOFIL	12	15	18	24	36
9	13C704073002	FLOAT FOR AUTOFIL	12	15	18	24	36
10	13C701813002	ANGLE 10/6	1	1	1	1	1
11	13C701815002	TEE 10/10/6	3	3	4	4	4
12	13C701558002	END PIECE	4	5	6	6	6
13	13C701824002	PVC Transparent Hose NW 6	4 MTR	4mtr	5 MTR	5 MTR	5mtr
14	13C701825002	PVC Transparent Hose NW 10	4 MTR	4mtr	5 MTR	5 MTR	5mtr

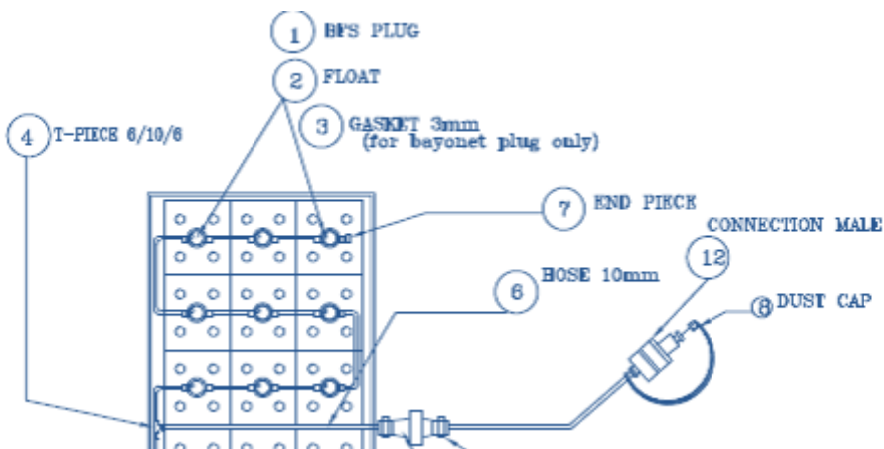


## Typical Installation

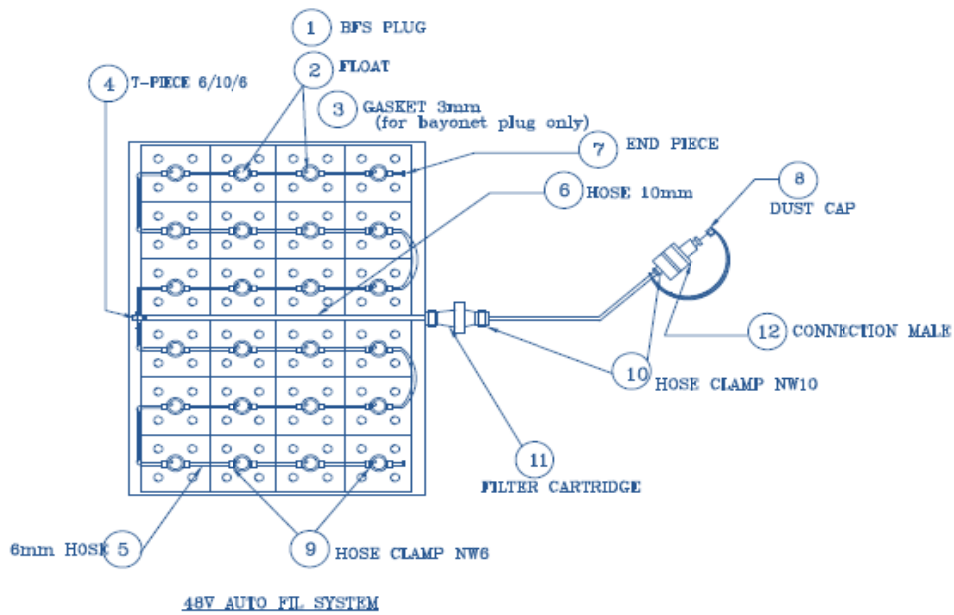


24V AUTO FIL SYSTEM

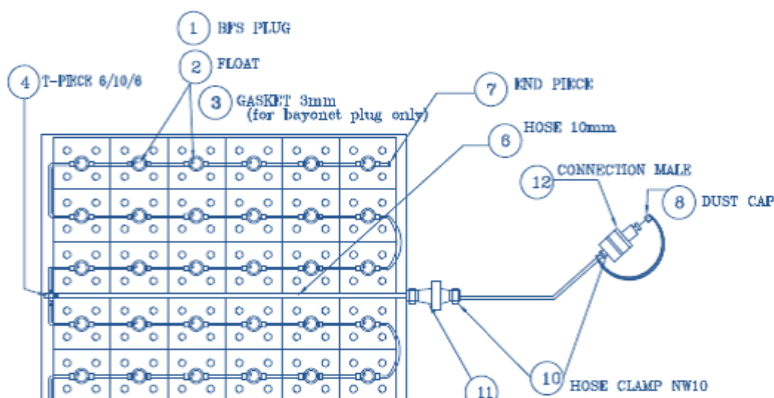
Sl.no.	Quant.	DESCRIPTION
1	12	BFS-PLUG III(PUSH IN)
1a	12	FLOAT
2	1	T-PIECE 6/10/6mm
3	3M	HOSE 6mm
4	2M	HOSE 10mm
5	2	END PIECE
6	1	DUST CAP
7	24	HOSE CLAMP 6mm
8	4	HOSE CLAMP 10mm
9	1	FILTER CARTRIDGE
10	1	CONNECTION MALE



Sl.no.	Quant.	DESCRIPTION
1	18	BFS-PLUG III(PUSH IN)
2	18	FLOAT 07...
3	18	GASKET(FOR BAYONET ONLY)
4	1	T-PIECE 6/10/6mm
5	5M	HOSE 6mm
6	5M	HOSE 10mm
7	2	END PIECE
8	1	DUST CAP
9	36	HOSE CLAMP 6mm
10	4	HOSE CLAMP 10mm
11	1	FILTER CARTRIDGE
12	1	CONNECTION MALE



Sl.no.	Quant.	DESCRIPTION
1	24	BFS-PLUG III(PUSH IN)
2	24	FLOAT 07...
3	24	GASKET(FOR BAYONET ONLY)
4	1	T-PIECE 6/10/6mm
5	5M	HOSE 6mm
6	5M	HOSE 10mm
7	2	END PIECE
8	1	DUST CAP
9	48	HOSE CLAMP 6mm
10	4	HOSE CLAMP 10mm
11	1	FILTER CARTRIDGE
12	1	CONNECTION MALE



Sl.no.	Quant.	DESCRIPTION
1	36	BFS-PLUG III(PUSH IN)
2	36	FLOAT 07...
3	36	GASKET(FOR BAYONET ONLY)
4	1	T-PIECE 6/10/6mm
5	5M	HOSE 6mm
6	5M	HOSE 10mm
7	2	END PIECE
8	1	DUST CAP
9	72	HOSE CLAMP 6mm
10	4	HOSE CLAMP 10mm

## Topping up

To ensure a fault free operation of the watering system, we highly recommend installing the fine filter directly on the battery, a filter of 100 micron, to capture all remaining water impurities. Water pressure can be up to 3.8bar – 53psi, but should not be lower than 0.2bar – 3.0psi; the optimum range is from 0,3bar – 4psi to 1,8bar – 25psi.

**It is recommended to water the batteries toward the end of the charging time.  
Never fill distilled water in a battery before it has been charged.**

## Cleaning

Only use plain water when cleaning any of the products. Do not use detergents.

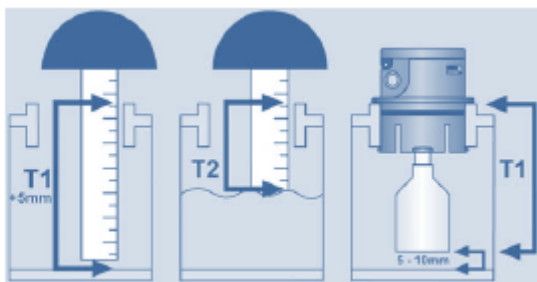
## Float Selection

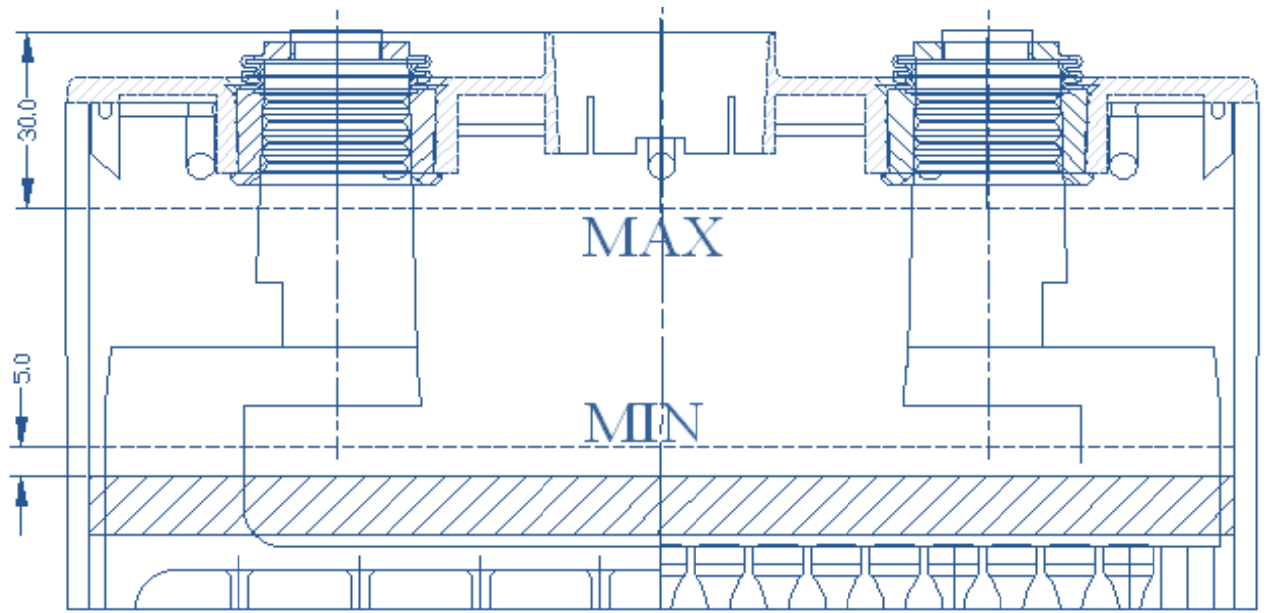
The Automated Battery Filling System offers quite a large variety of float sizes. According to the individual cell design and the desired height of electrolyte, the right float height has to be selected. Only if the right float size has been chosen will the watering system work to all expectations. At least 5 mm space should be provided between the lower end of the float and the high end of the separator and 30mm space in between the Vent Well bottom and the Maximum Level.

When assembling float and plug, watch out for the loud “Click” at the very moment of pushing float to float stem.

### Float Selection Table

diameter mm	Ø 26	Ø 22	Ø 22	Ø 22	Ø 22	Ø 22	Ø 22	Ø 22	Ø 22	Ø 22	Ø 14	Ø 14	Ø 19	Ø 19	Ø 19
height mm	h 12	h 14	h 20	h 24	h 29	h 34	h 39	h 44	h 49	h 59	h 41	h 32	h 26	h 33	h 42
	T1 / T2 mm														
push In plug III	42/31	41/29	47/34	51/39	55/42	61/46	66/50	71/53	76/57	86/68	66/39	57/35	54/38	60/44	69/49





# INSTALLATION & MAINTENANCE of BATTERY MONITORING SYSTEM & ELECTRONIC LEVEL SYSTEM

## BMS BATTERY MONITORING SYSTEM

*For motive power and standby applications*



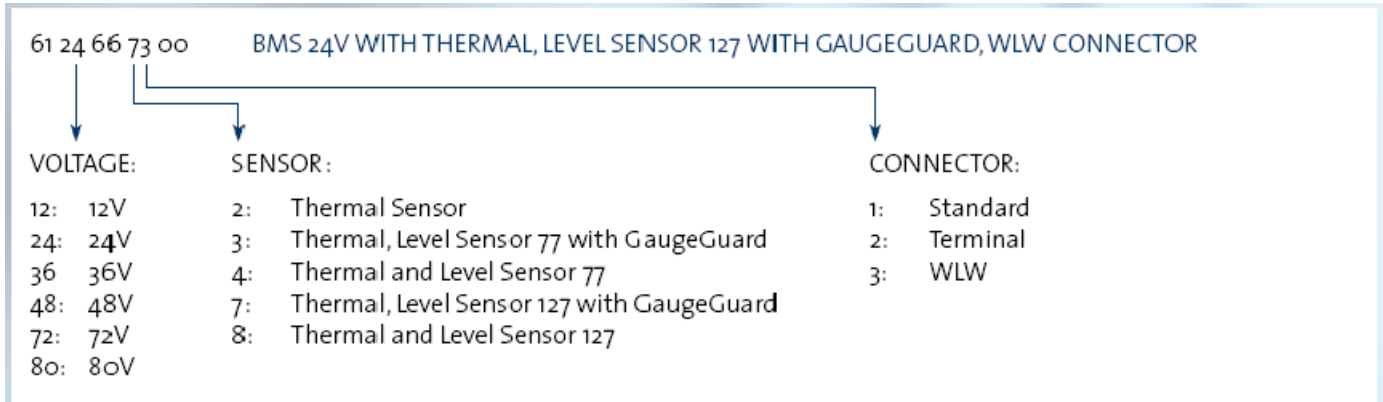
### DESCRIPTION

The BMS is a quality product from Abertax Technologies. It gives essential battery information i.e. full voltage, half voltage, and temperature and electrolyte level. It stores the number of charge/discharge cycles, temperature, electrolyte low level duration and deep discharge duration.

The sensor has 3 LEDs, which indicate the following:

- *Flashing green: when powered and no warnings*
- *Flashing red: electrolyte level below specified minimum for flooded batteries and low voltage for maintenance free batteries*
- *Flashing yellow: battery temperature above 50°C*

## How to Order the correct BMS.



# BMS BATTERY MONITORING SYSTEM

for motive power and standby applications

## INSTALLATION

### Battery Monitoring System

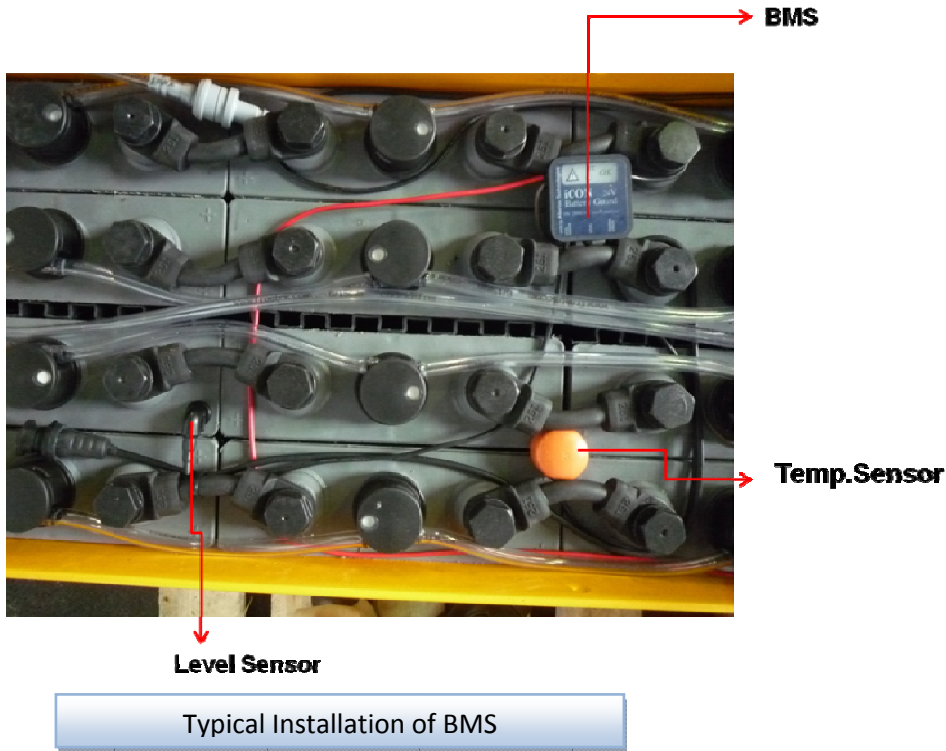
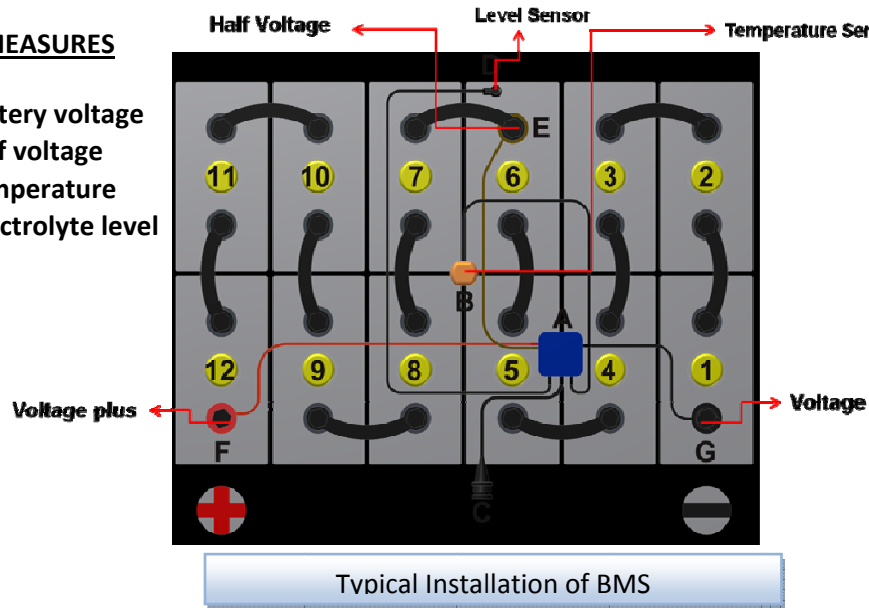


#### MEASURES

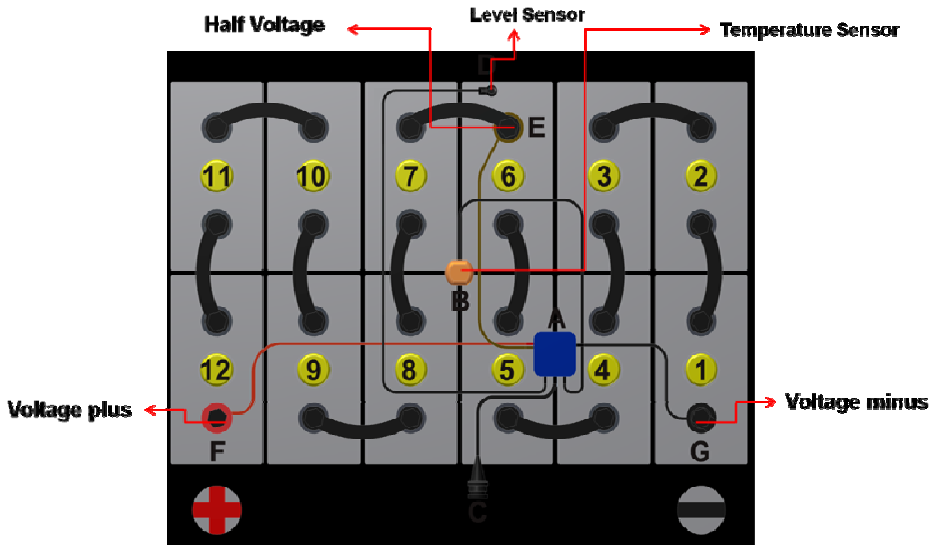
- Battery voltage
- Half voltage
- Temperature
- Electrolyte level

#### STORES

- Full and half voltages
- Charge / discharge cycles
- Temperature
- Electrolyte level
- Deep discharge



## Installation Instructions

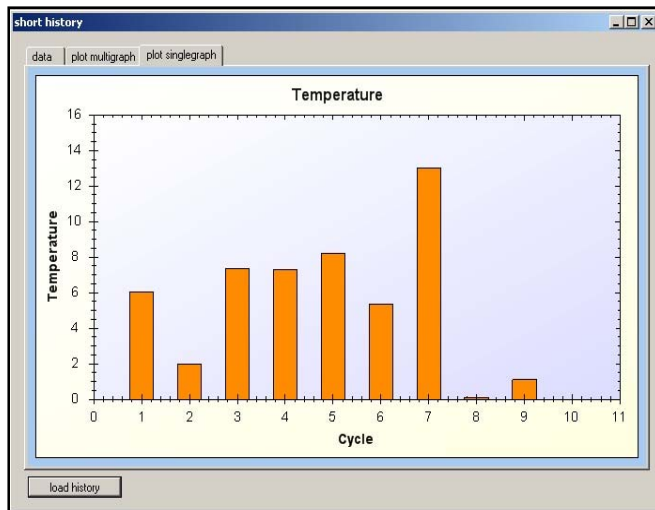
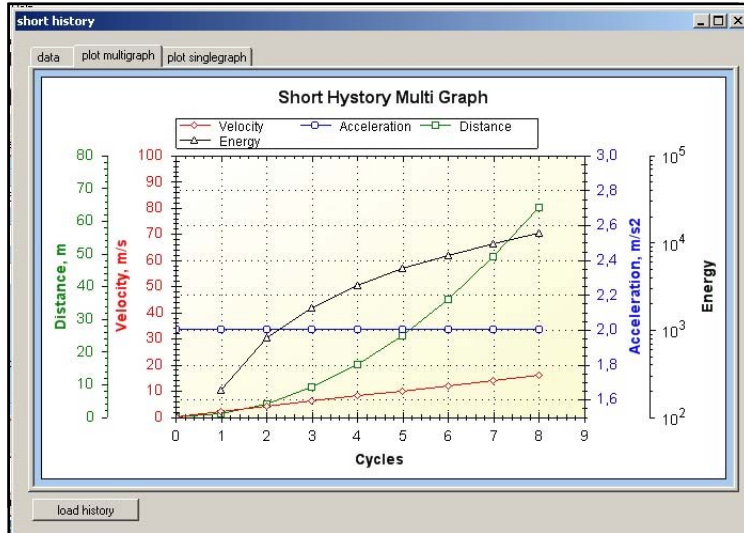


- Place the BMS(A) close to the center of the battery bank as shown in the diagram above between cells 4 and 5.
- Install the negative connection (G-Black Wire) to the main negative terminal. Cell 1 as shown in the diagram above. Ensure that an approved connection method is used.
- Install the full voltage (F-red wire) to the cell with highest voltage, as shown in the diagram above to cell 12 positive terminal. Ensure that an approved connection method is used.
- Install the Half voltage (E-Brown wire) to the cell with a voltage equal to half the full voltage, as shown in the diagram above to cell 6 positive terminal. Ensure than an approved connection method is used.
- Cut the Level sensor Probe and install the level sensor (D) in the 6<sup>th</sup> cell, as shown above.
- Install the temperature sensor (B-orange housing) in between four cells, as close as possible to the centre of the battery bank as shown in the diagram above between cells 5,6,7 and 8.
- All three Leds will light for the first 6 minutes. During this time the battery must not be charged or discharged. The battery may be used once the three LEDs on the BMS stop Blinking.

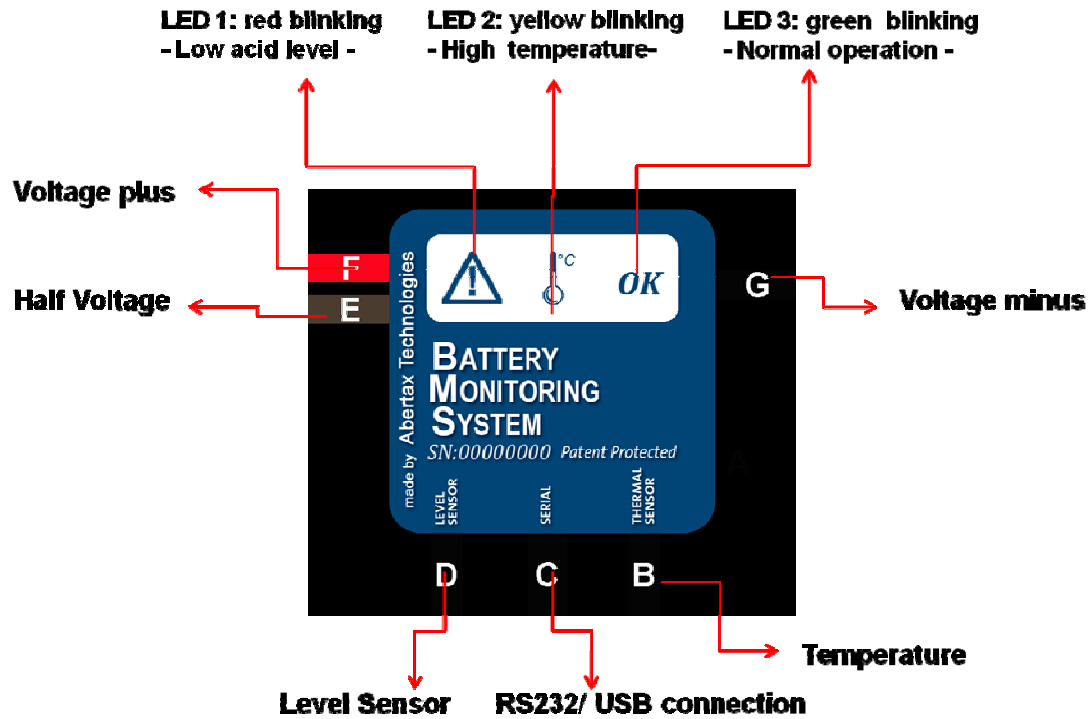


# SOFTWARE

Stored data can be downloaded for evaluation. The available software will display: on time, discharge time, number of charge and discharge events, low acid level time, over temperature time, battery/ambient temperature and full/half battery voltage. Data can be downloaded via cable or wireless (Bluetooth).



## FUNCTIONING



## MECHANICAL CONSTRUCTION

The sensors have an acid resistant housing. It features an additional cable for communication with the computer. For flooded batteries probe and Gauge Guard have to be ordered to length. A drill given with the sensor should be used for drilling the Gauge Guard hole.

### TECHNICAL SPECIFICATIONS

Supply voltage	8V -130V
Current consumption	<33mA
Temperature set point	50°C
Operational temperature range	-25...+80°C
Serial interface	9.6K Baud, 3.3V level
Weight	185 g

# ELECTRONIC LEVEL SENSOR

## The Product List

### ABERTAX CLS - Capacitive Battery Electrolyte Level Sensors

#### ABERTAX CLS Standard



Type	Probe Length	Part Number
O-Ring*	77 mm	55 72 01 03 00N
	127 mm***	55 22 01 03 000
Gauge Guard**	77 mm	55 71 01 03 00A
	127 mm	55 21 01 03 00N

#### ABERTAX CLS with External Probe



with  
Interbattery  
Blade

with  
Strapping  
Bracket

Type	Probe Length	Part Number
O-Ring*	77 mm	55 73 06 03 006
	127 mm***	55 23 06 03 00J
Gauge Guard**	77 mm	55 71 06 03 00G
	127 mm	55 21 06 03 00U
O-Ring*	77 mm	55 83 06 03 00Q
	127 mm***	55 81 06 03 000
Gauge Guard**	77 mm	55 84 06 03 002
	127 mm	55 82 06 03 00C

#### ABERTAX CLS with External LED



Type	Probe Length	Part Number
O-Ring*	77 mm	55 72 02 03 00W
	127 mm***	55 22 02 03 008
Gauge Guard**	77 mm	55 71 02 03 00J
	127 mm	55 21 02 03 00W

#### ABERTAX CLS Multi Layer



with  
Interbattery  
Blade

with  
Strapping  
Bracket

Type	Probe Length	Part Number
O-Ring*	77 mm	55 72 03 03 004
	127 mm***	55 22 03 03 00G
Gauge Guard**	77 mm	55 71 03 03 00S
	127 mm	55 21 03 03 004
O-Ring*	77 mm	55 83 03 03 000
	127 mm***	55 81 03 03 00A
Gauge Guard**	77 mm	55 84 03 03 00C
	127 mm	55 82 03 03 00N

#### Applications:

1. Standard:
2. with External Probe:
3. with External LED:
4. Multi Layer:

suitable for all batteries; ultimate as a control for small cells  
suitable for small batteries (BS and 2PzS (DIN))  
to display the electrolyte level outside the battery (operator area)  
for double layer batteries and with difficult accessibility

#### Other Types:

all sensors can be supplied with additional "beeper"  
so as to give an acoustic signal by low electrolyte level

#### Connections:

sensors are supplied with patented connector (WLW\*\*\*\*)  
other connections are available on request:



or



WLW

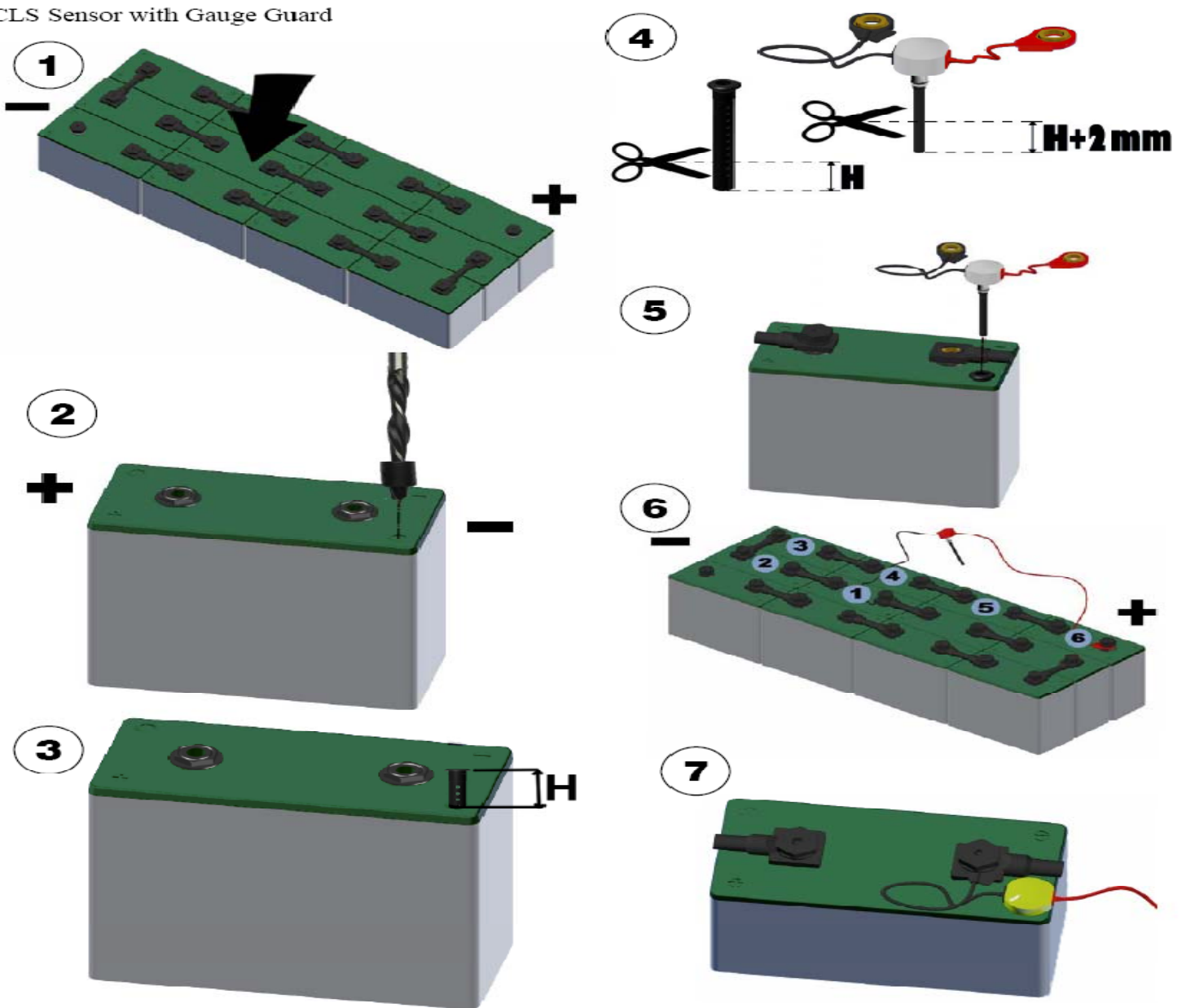


Drill

- \* O-Ring for mounting in perforated opening in battery lid (air circulation)
- \*\* Gauge Guard for mounting by using 10mm Drill supplied by Abertax
- \*\*\* 127 mm length for LM (low maintenance cells with low plates)
- \*\*\*\* Patentierter Verbinder

## Installation of Electronic Level sensor

CLS Sensor with Gauge Guard



- The probe is to be fitted in the hole present at the corner of the LID.
- Use the Drill supplied with the sensor for Drilling the hole.
- Measure the Probe length required by inserting the probe till it touches the Plate Top.
- Measure the dimension  $H$  and Cut  $H+2\text{ mm}$  from the probe measuring from the Bottom edge to the Top.