

# VRPP

## Nickel Cadmium Valve Regulated Pocket Plate Batteries



### Dimensional and Electrical Performance



## Valve Regulated Pocket Plate (VRPP) Batteries

The Valve Regulated Pocket Plate (VRPP) battery developed by HBL combines the unmatched reliability of Nickel Cadmium pocket plate technology, with the convenience of **reduced maintenance requirements**.

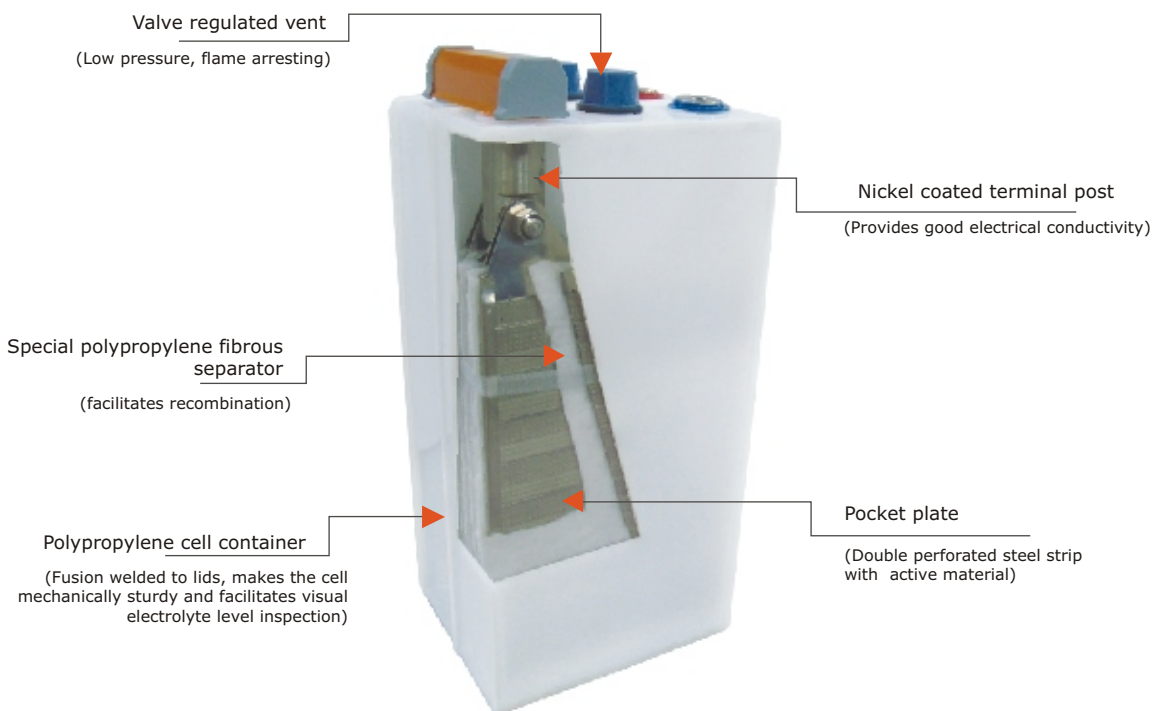
VRPP's controlled recombination system, with valve regulated venting means **no water replenishment is needed during its lifetime under recommended operating conditions**. VRPP perform in severe in temperatures ranging from  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ , and can survive over-discharge, reversal or prolonged overcharge with no damage.

The Proven Pocket Plate design of HBL consists of the active materials encapsulated between folded steel strips which are perforated from both sides. This double perforation method increases the effective surface area by 30% and helps in better utilization of the active material thereby making the battery more efficient. In addition to the Pocket Plate design, the VRPP batteries use a **special separator** which allows gases generated during charging to **recombine** inside the cell thus ensuring no water is lost. This makes the VRPP battery with **reduced maintenance**. A self **resealing type vent cap** is also employed to release any excess pressure developed inside the cell during abnormal operation.

## Construction

The construction of HBL VRPP Cell is based upon conventional **proven pocket** plate technology, introducing special features to eliminate the need for water topping.

The separator is a key feature of the VRPP Battery



VRPP Battery conforms to IEC 60623 & IEC 62259

## VRPP benefits

- ▷ Twenty years without topping - up in normal applications
- ▷ Long life
- ▷ Reliable and predictable performance
- ▷ Resistant to abuse, electrical and mechanical
- ▷ Reduced maintenance requirements
- ▷ No sudden death failure due to internal corrosion
- ▷ Wide operating temperature range
- ▷ Low installation and life cycle cost
- ▷ Negligible gassing
- ▷ Excellent high rate discharge capability
- ▷ Good Performance at low temperature



IEC/EN 60623

The fully integrated modern factory, supported by strong process management and quality controls makes HBL one of the best Nickel Cadmium battery production facilities in the world.

## Battery applications

HBL's VRPP batteries are the best solution for installations, whether they are UPS systems, emergency lighting systems, telecommunications, where the risk of failure of the system is unacceptable and frequent maintenance is difficult. VRPP batteries are also eminently suitable for remote applications such as photovoltaic systems, offshore oil and gas and switching substations, where the system must have total reliability with reduced battery maintenance.

Various applications where VRPP is used:

- ▷ Emergency lighting
- ▷ Railway signaling
- ▷ Switchgear
- ▷ Telecommunications
- ▷ Fire and Security systems
- ▷ UPS
- ▷ Offshore oil and gas
- ▷ Photovoltaics
- ▷ Process control
- ▷ Mass transit



## Battery charging:

In order to ensure that the reduced maintenance property of VRPP battery, it is necessary to control the charge input to the battery to minimize the rate of water loss during the life of the product. It is important therefore that the recommended charge conditions are complied with.

### A) Charging in commissioning

A good commissioning charge is required as per given below.

- ❖ Constant current charge: 16 hours at 0.1 C<sub>5</sub>A recommended
- ❖ Constant potential charge: 1.65 V/cell for a maximum of 30 hours current limited to 0.1 C<sub>5</sub>A
- ❖ If these methods are not available, then charging may be carried out at lower voltages, 1.50 V/cell for 72 hours minimum.

### B) Charging in service

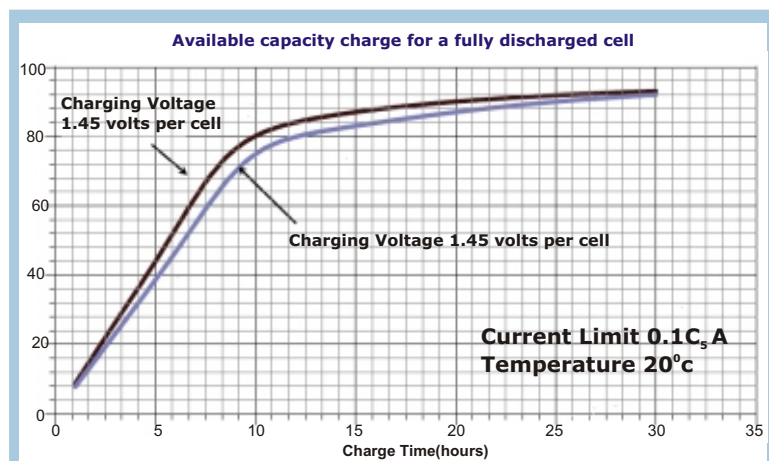
The recommended charging voltages for continuous parallel operation, with occasional battery discharges, are:

- ❖ For two level charge:
  - Float voltage : 1.42 V/cell
  - Boost voltage : 1.45 V/cell
- ❖ For single level charge: 1.42 V/cell

## Charge acceptance:

The performance tables given in this technical catalogue are for fully flood charged cells, is after several months of floating. A discharged cell takes certain time to achieve this, below graph shows the capacity available during the first 30 hours of charge when charged using recommended charged Voltage of 1.42 V/cell and 1.45 V/cell.

### AVAILABLE CAPACITY ON FLOAT CHARGE



Refer user manual for maximising the performance of VRPP battery in various operating conditions

# VRPP Range

## Cell Dimensions and Weight Details

Cell type	Capacity at 5 hour rate (Ah)	Cont. Size Ref.	Cell Dimensions in mm						Approx weight(Kg)		Cell Connection Bolt(s) Size	Volume of Electrolyte above Plates (cc)
			Height	Width	Length				1.2V	2.4V		
					1.2V L(1)	2.4V L(2)	3.6V L(3)	4.8V L(4)				
VRPP 8	8	B21-1	264	123		79	110	140		2.80	M6	151
VRPP 12	12	B21-1	264	123		79	110	140		2.92	M6	151
VRPP 16	16	B21-1	264	123		79	110	140		3.10	M6	151
VRPP 18	18	B21-1	264	123		79	110	140		3.30	M6	151
VRPP 24	24	B22-1	264	123		88	124	160		3.68	M6	178
VRPP 27	27	B23-1	264	123		113	161	208		4.70	M6	245
VRPP 32	32	B23-1	264	123		113	161	208		5.00	M6	245
VRPP 36	36	B23-1	264	123		113	161	208		5.40	M6	245
VRPP 40	40	B24-1	264	123		137	197	256		6.20	M6	312
VRPP 45	45	B24-1	264	123		137	197	256		6.80	M6	312
VRPP 50	50	B45-1	405	195		91	126			9.70	M10	466
VRPP 57	57	B45-1	405	195		91	126			9.90	M10	466
VRPP 66	66	B45-1	405	195		91	126			10.2	M10	466
VRPP 71	71	B45-1	405	195		91	126			10.4	M10	466
VRPP 76	76	B44-1	405	195		104	148			11.8	M10	580
VRPP 82	82	B44-1	405	195		104	148			12.6	M10	580
VRPP 89	89	B44-1	405	195		104	148			12.8	M10	580
VRPP 95	95	B44-1	405	195		104	148			13.0	M10	580
VRPP 103	103	B42A-1	405	195		125	179			14.8	M10	803
VRPP 111	111	B42A-1	405	195		125	179			15.4	M10	803
VRPP 119	119	B42A-1	405	195		125	179			15.8	M10	803
VRPP 133	133	B42-1	405	195		144	204			17.8	M10	917
VRPP 142	142	B42-1	405	195		144	204			18.4	M10	917
VRPP 155	155	B41B-1	405	195		169	242			20.8	M10	1130
VRPP 166	166	B41B-1	405	195		169	242			21.6	M10	1130
VRPP 178	178	B44-2	405	195	110	197	284		12.6		2xM10	1160
VRPP 190	190	B44-2	405	195	110	197	284		12.8		2xM10	1160
VRPP 206	206	B42A-2	405	195	131	239	347		14.8		2xM10	1606
VRPP 222	222	B42A-2	405	195	131	239	347		15.4		2xM10	1606
VRPP 238	238	B42A-2	405	195	131	239	347		15.8		2xM10	1606
VRPP 266	266	B42-2	405	195	144	264	384		17.8		2xM10	1834
VRPP 285	285	B42-2	405	195	144	264	384		18.5		2xM10	1834
VRPP 310	310	B41B-2	405	195	169	315	461		20.8		2xM10	2260
VRPP 332	332	B41B-2	405	195	169	315	461		21.6		2xM10	2260
VRPP 357	357	B42A-3	405	195	185	347			23.4		3xM10	2409
VRPP 370	370	B42-3	405	195	204				24.5		3xM10	2751
VRPP 400	400	B42-3	405	195	204				25.9		3xM10	2751
VRPP 426	426	B42-3	405	195	204				26.8		3xM10	2751
VRPP 438	438	B41B-3	405	195	242				29.2		3xM10	3390
VRPP 476	476	B41B-3	405	195	242				30.0		3xM10	3390
VRPP 498	498	B41B-3	405	195	242				31.2		3xM10	3390
VRPP 530	530	B42-4	405	195	264				33.6		4xM10	3668
VRPP 570	570	B42-4	405	195	264				34.2		4xM10	3668
VRPP 600	600	B42A-5	405	195	293				37.3		5x M10	4015
VRPP 624	624	B41B-4	405	195	315				39.4		4xM10	4520
VRPP 664	664	B41B-4	405	195	315				41.2		4xM10	4520
VRPP 710	710	B42-5	405	195	324				43.9		5x M10	4585
VRPP 728	728	B41B-5	405	195	388				47.0		5x M10	5650
VRPP 775	775	B41B-5	405	195	388				48.2		5x M10	5650
VRPP 830	830	B41B-5	405	195	388				49.6		5x M10	5650
VRPP 850	850	B41B-5	405	195	388				50.2		5x M10	5650
VRPP 873	873	B41B-6	405	195	461				52.7		6x M10	6780

\* In accordance with its policy of continuous improvement the company reserves the right to change specifications and designs without notice  
Illustrations, data, dimensions and weights given in this brochure are for guidance only and cannot be held binding on the company.



# Performance data

## Performance after prolonged float charge of fully charged cells

Available amperes at +20 ± 5 deg.C

End Voltage 1.00 V / Cell

Cell Type	C5Ah	Hours					Minutes						Seconds			
		10	8	5	3	2	90	60	45	30	10	5	60	30	10	1
VRPP 8	8	0.82	1.02	1.60	2.56	3.78	4.71	6.12	6.90	8.00	10.9	12.2	16.2	17.9	21.1	25.5
VRPP 12	12	1.24	1.54	2.40	3.85	5.67	7.06	9.18	10.3	12.0	16.3	18.4	24.2	26.8	31.6	38.2
VRPP 16	16	1.65	2.05	3.20	5.13	7.56	9.41	12.2	13.8	16.0	21.8	24.5	32.3	35.7	42.2	51.0
VRPP 18	18	1.86	2.30	3.60	5.77	8.51	10.6	13.8	15.5	18.0	24.5	27.5	36.4	40.2	47.4	57.3
VRPP 24	24	2.47	3.07	4.80	7.69	11.3	14.1	18.4	20.7	24.0	32.7	36.7	48.5	53.6	63.2	76.5
VRPP 27	27	2.78	3.46	5.40	8.65	12.8	15.9	20.7	23.3	27.0	36.7	41.3	54.5	60.3	71.1	86.0
VRPP 32	32	3.30	4.10	6.40	10.3	15.1	18.8	24.5	27.6	32.0	43.5	49.0	64.6	71.4	84.3	102
VRPP 36	36	3.71	4.61	7.20	11.5	17.0	21.2	27.5	31.0	36.0	49.0	55.1	72.7	80.4	94.9	115
VRPP 40	40	4.12	5.12	8.00	12.8	18.9	23.5	30.6	34.5	40.0	54.4	61.2	80.8	89.3	105	128
VRPP 45	45	4.64	5.68	9.00	14.4	21.3	26.5	34.4	38.8	45.0	61.2	68.8	90.9	100	119	143
VRPP 50	50	5.08	6.31	10.0	16.3	23.9	29.4	38.3	43.3	49.9	66.2	70.6	86.8	94.5	108	126
VRPP 57	57	5.80	7.19	11.4	18.6	27.2	33.5	43.6	49.4	56.8	75.5	80.5	99.0	108	123	143
VRPP 66	66	6.71	8.33	13.2	21.6	31.5	38.8	50.5	57.1	65.8	87.4	93.2	115	125	142	166
VRPP 71	71	7.22	8.96	14.2	23.2	33.9	41.8	54.3	61.5	70.8	94.0	100	123	134	153	179
VRPP 76	76	7.73	9.59	15.2	24.8	36.3	44.7	58.1	65.8	75.8	101	107	132	144	164	191
VRPP 82	82	8.34	10.3	16.4	26.8	39.1	48.2	62.7	71.0	81.8	109	116	142	155	177	206
VRPP 89	89	9.05	11.2	17.8	29.1	42.5	52.4	68.1	77.1	88.7	118	126	155	168	192	224
VRPP 95	95	9.66	12.0	19.0	31.0	45.3	55.9	72.7	82.3	94.7	126	134	165	180	205	239
VRPP 103	103	10.5	13.0	20.6	33.7	49.2	60.6	78.8	89.2	103	136	145	179	195	222	259
VRPP 111	111	11.3	14.0	22.2	36.3	53.0	65.3	84.9	96.1	111	147	157	193	210	239	279
VRPP 119	119	12.1	15.0	23.8	38.9	56.8	70.0	91.0	103	119	157	168	207	225	256	299
VRPP 133	133	13.5	16.8	26.6	43.5	63.5	78.2	102	115	133	176	188	231	251	287	334
VRPP 142	142	14.5	17.9	28.4	46.4	67.8	83.5	109	123	142	188	201	247	269	306	357
VRPP 155	155	15.8	19.6	31.0	50.7	74.0	91.2	119	134	155	205	219	269	293	334	389
VRPP 166	166	16.9	21.0	33.2	54.2	79.2	97.6	127	144	165	220	234	288	314	358	417
VRPP 178	178	18.1	22.5	35.6	58.2	85.0	105	136	154	177	236	251	309	336	384	447
VRPP 190	190	22.6	24.0	38.0	62.1	90.7	112	145	165	189	251	268	330	359	409	478
VRPP 206	206	21.0	26.0	41.2	67.3	98.3	121	158	178	205	273	291	358	389	444	518
VRPP 222	222	22.6	28.0	44.4	72.5	106	131	170	192	221	294	314	385	420	478	558
VRPP 238	238	24.3	30.0	47.6	77.8	114	140	182	206	237	315	336	413	450	513	598
VRPP 266	266	27.1	33.6	53.2	86.9	127	156	204	230	265	352	376	462	503	573	668
VRPP 285	285	29.1	36.0	57.0	93.1	136	168	218	247	284	377	403	495	539	614	717
VRPP 310	310	31.6	39.1	62.0	101	148	182	237	268	309	411	438	538	586	668	779
VRPP 332	332	33.8	41.9	66.4	108	158	195	254	287	331	440	469	576	628	716	834
VRPP 357	357	36.3	45.1	71.4	117	170	210	273	309	357	472	504	621	675	769	897
VRPP 370	370	37.7	46.7	74.0	121	177	218	283	320	369	490	523	642	699	797	930
VRPP 400	400	40.8	50.5	80.0	131	191	235	306	346	399	530	565	694	756	862	1005
VRPP 426	426	43.5	53.8	85.2	139	203	251	327	369	426	564	603	741	807	918	1071
VRPP 438	438	44.7	55.3	87.6	143	209	258	335	379	437	580	619	760	828	944	1101
VRPP 476	476	48.6	60.1	95.2	156	228	280	364	412	474	630	672	826	900	1026	1196
VRPP 498	498	50.8	62.9	99.6	163	238	293	381	431	497	660	703	865	941	1073	1251
VRPP 530	530	54.1	66.9	106	173	253	312	406	459	528	702	749	920	1002	1142	1332
VRPP 570	570	58.2	71.9	114	186	272	335	436	494	568	755	805	990	1078	1228	1432
VRPP 600	600	61.2	75.7	120	196	286	353	459	519	598	795	847	1042	1134	1293	1508
VRPP 624	624	63.7	78.8	125	204	298	367	477	540	622	826	881	1083	1180	1345	1568
VRPP 664	664	67.8	83.8	133	217	317	391	508	575	662	879	938	1153	1255	1431	1668
VRPP 710	710	72.4	89.6	142	232	339	418	543	615	708	940	1003	1233	1342	1530	1784
VRPP 728	728	74.3	91.9	146	238	347	428	557	630	726	964	1028	1264	1376	1569	1829
VRPP 775	775	79.1	97.8	155	253	370	456	593	671	773	1026	1095	1345	1465	1670	1947
VRPP 830	830	84.7	105	166	271	396	488	635	719	828	1099	1172	1441	1569	1789	2085
VRPP 850	850	86.7	107	170	278	406	500	650	736	847	1126	1201	1476	1607	1832	2136
VRPP 873	873	89.1	110	175	285	417	514	668	756	870	1156	1233	1516	1650	1881	2193



# Performance data

## Performance after prolonged float charge of fully charged cells

Available amperes at +20 ± 5 deg.C

End Voltage 1.05 V / Cell

Cell Type	C5Ah	Hours					Minutes						Seconds			
		10	8	5	3	2	90	60	45	30	10	5	60	30	10	1
VRPP 8	8	0.80	1.00	1.58	2.53	3.54	4.32	5.44	5.93	6.45	8.51	9.86	13.3	15.0	17.5	22.1
VRPP 12	12	1.20	1.50	2.37	3.80	5.31	6.49	8.16	8.89	9.68	12.8	14.8	19.9	22.4	26.3	33.1
VRPP 16	16	1.60	2.00	3.16	5.06	7.08	8.65	10.9	11.9	12.9	17.0	19.7	26.5	29.9	35.0	44.2
VRPP 18	18	1.80	2.25	3.55	5.70	7.96	9.73	12.2	13.3	14.5	19.1	22.2	29.9	33.6	39.4	49.7
VRPP 24	24	2.40	3.00	4.73	7.59	10.6	13.0	16.3	17.8	19.4	25.5	29.6	39.8	44.9	52.5	66.3
VRPP 27	27	2.70	3.38	5.33	8.54	11.9	14.6	18.4	20.0	21.8	28.7	33.3	44.8	50.5	59.1	74.6
VRPP 32	32	3.20	4.00	6.31	10.1	14.2	17.3	21.8	23.7	25.8	34.0	39.5	53.1	59.8	70.0	88.4
VRPP 36	36	3.60	4.50	7.10	11.4	15.9	19.5	24.5	26.7	29.0	38.3	44.4	59.7	67.3	78.8	99.4
VRPP 40	40	4.10	5.00	7.89	12.7	17.7	21.6	27.2	29.6	32.3	42.6	49.3	66.3	74.8	87.5	111
VRPP 45	45	4.50	5.63	8.88	14.2	19.9	24.3	30.6	33.3	36.3	47.9	55.5	74.6	84.1	98.5	124
VRPP 50	50	5.04	6.24	9.92	16.1	22.9	26.9	32.7	36.3	42.0	52.6	58.6	74.8	80.3	89.8	105
VRPP 57	57	5.74	7.12	11.3	18.3	26.1	30.7	37.3	41.4	47.9	60.0	66.8	85.3	91.5	102	120
VRPP 66	66	6.65	8.24	13.1	21.2	30.3	35.6	43.1	48.0	55.5	69.5	77.4	98.7	105.9	118	139
VRPP 71	71	7.15	8.86	14.1	22.8	32.6	38.3	46.3	51.6	59.7	74.8	83.3	106	114	128	149
VRPP 76	76	7.65	9.49	15.1	24.4	34.9	40.9	49.7	55.2	63.9	80.0	89.1	114	122	136	159
VRPP 82	82	8.26	10.2	16.3	26.4	37.6	44.2	53.6	59.6	68.9	86.3	96.1	123	132	147	172
VRPP 89	89	8.96	11.1	17.7	28.6	40.8	48.0	58.2	64.7	74.8	93.7	104	133	143	160	187
VRPP 95	95	9.57	11.9	18.9	30.5	43.6	51.2	61.9	69.0	79.8	100	111	142	152	171	199
VRPP 103	103	10.4	12.9	20.4	33.1	47.2	55.5	67.3	74.9	86.6	108	121	154	165	185	216
VRPP 111	111	11.2	13.9	22.0	35.7	50.9	59.8	72.5	80.7	93.3	117	130	166	178	199	233
VRPP 119	119	12.0	14.9	23.6	38.3	54.6	64.2	77.6	86.5	100	125	140	178	191	214	249
VRPP 133	133	13.4	16.6	26.4	42.8	61.0	71.7	86.9	96.7	112	140	156	199	213	239	279
VRPP 142	142	14.3	17.7	28.2	45.7	65.1	76.6	92.6	103	119	150	167	213	228	255	298
VRPP 155	155	15.6	19.4	30.8	49.8	71.1	83.5	101	113	130	163	182	232	249	278	325
VRPP 166	166	16.7	20.7	33.0	53.4	76.1	89.5	108	121	139	175	195	248	266	298	348
VRPP 178	178	17.9	22.2	35.3	57.2	81.7	95.9	116	129	150	187	209	266	286	320	374
VRPP 190	190	19.2	23.7	37.7	61.1	87.2	102	124	138	160	200	223	284	305	341	398
VRPP 206	206	20.7	25.7	40.9	66.2	94.5	111	135	150	173	217	242	308	331	370	432
VRPP 222	222	22.4	27.7	44.0	71.4	102	120	145	161	187	234	260	332	356	399	466
VRPP 238	238	24.0	29.7	47.2	76.5	109	128	155	173	200	251	279	356	382	427	499
VRPP 266	266	26.8	33.2	52.8	85.5	122	143	174	193	224	280	312	398	427	478	558
VRPP 285	285	28.7	35.6	56.6	91.6	131	154	186	207	239	300	334	426	457	512	597
VRPP 310	310	31.2	38.7	61.5	99.7	142	167	203	225	261	326	363	464	498	557	651
VRPP 332	332	33.4	41.4	65.9	107	152	179	217	241	279	349	389	497	533	596	697
VRPP 357	357	36.0	44.7	70.8	115	164	193	233	260	300	376	420	534	573	642	748
VRPP 370	370	37.3	46.2	73.4	119	170	199	242	269	311	389	434	553	594	664	776
VRPP 400	400	40.3	49.9	79.4	129	183	216	261	291	336	421	469	598	642	718	839
VRPP 426	426	42.9	53.2	84.6	137	195	230	278	310	358	450	501	639	684	765	894
VRPP 438	438	44.1	54.7	86.9	141	201	236	286	318	368	461	513	655	703	786	919
VRPP 476	476	47.9	59.4	94.4	153	218	256	310	346	400	502	558	712	764	855	998
VRPP 498	498	50.2	62.2	98.8	160	228	268	325	362	418	524	584	745	799	894	1045
VRPP 530	530	53.4	66.2	105	170	243	286	346	385	445	558	621	793	851	952	1112
VRPP 570	570	57.4	71.2	113	183	261	307	373	414	479	600	668	853	915	1023	1196
VRPP 600	600	60.4	74.9	119	193	275	323	392	436	504	632	703	898	963	1077	1259
VRPP 624	624	62.8	77.9	124	201	286	336	408	453	524	657	732	933	1002	1120	1310
VRPP 664	664	66.9	82.9	132	214	305	358	434	483	558	699	778	993	1066	1192	1393
VRPP 710	710	71.5	88.6	141	228	326	383	464	516	597	747	832	1062	1140	1275	1490
VRPP 728	728	73.3	90.9	144	234	334	392	476	529	612	766	853	1089	1169	1307	1528
VRPP 775	775	78.0	96.8	154	249	356	418	507	563	651	816	909	1159	1244	1391	1626
VRPP 830	830	83.6	103.6	165	267	381	447	542	603	697	874	973	1242	1332	1490	1742
VRPP 850	850	85.6	106.1	169	273	390	458	556	618	714	895	996	1272	1364	1526	1784
VRPP 873	873	87.9	109.0	173	281	400	470	571	634	734	919	1023	1306	1401	1567	1832

# Performance data

## Performance after prolonged float charge of fully charged cells

Available amperes at +20 ± 5 deg.C

End Voltage 1.10 V / Cell

Cell Type	C5Ah	Hours					Minutes					Seconds				
		10	8	5	3	2	90	60	45	30	10	5	60	30	10	1
VRPP 8	8	0.80	1.00	1.55	2.27	2.97	3.51	4.42	4.76	5.26	6.50	7.56	10.6	11.9	14.1	17.9
VRPP 12	12	1.20	1.50	2.33	3.41	4.46	5.26	6.63	7.14	7.89	9.76	11.3	15.8	17.9	21.2	26.8
VRPP 16	16	1.60	2.00	3.10	4.55	5.95	7.02	8.84	9.52	10.5	13.0	15.1	21.1	23.8	28.2	35.7
VRPP 18	18	1.80	2.24	3.49	5.11	6.69	7.89	9.94	10.7	11.8	14.6	17.0	23.7	26.8	31.7	40.2
VRPP 24	24	2.40	2.99	4.65	6.82	8.92	10.5	13.3	14.3	15.8	19.5	22.7	31.7	35.7	42.3	53.6
VRPP 27	27	2.70	3.37	5.23	7.67	10.0	11.8	14.9	16.1	17.8	22.0	25.5	35.6	40.2	47.6	60.3
VRPP 32	32	3.20	3.99	6.20	9.09	11.9	14.0	17.7	19.0	21.1	26.0	30.3	42.2	47.6	56.4	71.4
VRPP 36	36	3.60	4.49	6.98	10.2	13.4	15.8	19.9	21.4	23.7	29.3	34.0	47.5	53.6	63.5	80.4
VRPP 40	40	4.00	4.99	7.75	11.4	14.9	17.6	22.1	23.8	26.4	32.5	37.8	52.8	59.5	70.5	89.3
VRPP 45	45	4.50	5.61	8.72	12.8	16.7	19.7	24.9	26.8	29.6	36.6	42.5	59.4	67.0	79.4	100
VRPP 50	50	5.00	6.20	9.71	15.1	20.5	23.6	27.6	30.1	33.2	41.0	45.5	58.6	65.4	71.8	78.4
VRPP 57	57	5.70	7.06	11.1	17.2	23.3	26.9	31.5	34.3	37.8	46.7	51.8	66.8	74.5	81.9	89.3
VRPP 66	66	6.60	8.18	12.8	20.0	27.0	31.1	36.5	39.7	43.8	54.1	60.0	77.4	86.3	94.8	103
VRPP 71	71	7.10	8.80	13.8	21.5	29.1	33.5	39.2	42.7	47.2	58.3	64.6	83.2	92.8	102	111
VRPP 76	76	7.60	9.42	14.8	23.0	31.1	35.8	42.0	45.7	50.5	62.3	69.1	89.1	99.3	109	119
VRPP 82	82	8.20	10.2	15.9	24.8	33.6	38.7	45.3	49.3	54.4	67.2	74.5	96.1	107	118	129
VRPP 89	89	8.90	11.0	17.3	26.9	36.4	42.0	49.2	53.5	59.1	73.0	80.9	104	116	128	139
VRPP 95	95	9.50	11.8	18.4	28.8	38.9	44.8	52.4	57.2	63.1	78.0	86.4	111	124	136	149
VRPP 103	103	10.3	12.8	20.0	31.2	42.2	48.6	56.9	61.9	68.4	84.4	93.6	121	135	148	161
VRPP 111	111	11.1	13.8	21.6	33.6	45.5	52.4	61.3	66.7	73.7	91.0	101	130	145	159	174
VRPP 119	119	11.9	14.7	23.1	36.0	48.7	56.1	65.6	71.6	79.1	97.7	108	140	156	171	187
VRPP 133	133	13.3	16.5	25.8	40.2	54.5	62.7	73.5	80.0	88.3	109	121	156	174	191	208
VRPP 142	142	14.2	17.6	27.6	43.0	58.1	67.0	78.3	85.4	94.3	117	129	167	186	204	223
VRPP 155	155	15.5	19.2	30.1	46.9	63.5	73.1	85.6	93.2	103	127	141	182	203	223	243
VRPP 166	166	16.6	20.6	32.2	50.3	68.0	78.3	91.6	99.8	110	136	151	195	217	239	260
VRPP 178	178	17.8	22.1	34.6	53.9	72.9	84.0	98.3	107	118	146	162	209	233	256	279
VRPP 190	190	19.0	23.5	36.9	57.5	77.7	89.6	105	114	126	156	173	223	248	273	298
VRPP 206	206	20.6	25.5	40.0	62.3	84.4	97.2	114	124	137	169	187	242	269	296	323
VRPP 222	222	22.2	27.5	43.1	67.2	90.9	105	123	133	147	182	202	260	290	319	348
VRPP 238	238	23.8	29.5	46.2	72.1	97.4	112	131	143	158	195	217	279	311	342	373
VRPP 266	266	26.6	33.0	51.7	80.5	109	125	147	160	177	218	242	312	348	382	417
VRPP 285	285	28.5	35.3	55.3	86.3	117	134	157	171	189	234	259	334	373	409	447
VRPP 310	310	31.0	38.4	60.2	93.8	127	146	171	186	206	254	282	363	405	445	486
VRPP 332	332	33.2	41.1	64.5	100	136	157	183	200	220	272	302	389	434	477	520
VRPP 357	357	35.7	44.2	69.3	108	146	168	197	215	237	293	325	420	467	513	561
VRPP 370	370	37.0	45.8	71.8	112	152	175	204	222	246	303	336	434	484	532	580
VRPP 400	400	40.0	49.6	77.7	121	164	189	221	241	266	328	364	469	523	575	627
VRPP 426	426	42.6	52.8	82.7	129	174	201	235	256	283	351	387	501	557	612	669
VRPP 438	438	43.8	54.3	85.0	133	179	207	242	263	291	359	398	513	573	629	687
VRPP 476	476	47.6	59.0	92.4	144	195	225	262	286	316	390	434	558	622	684	746
VRPP 498	498	49.8	61.7	96.7	151	204	235	275	299	331	408	453	584	651	716	781
VRPP 530	530	53.0	65.7	103	160	217	250	293	319	352	434	482	621	693	761	831
VRPP 570	570	57.0	70.6	111	172	233	269	315	343	378	467	518	668	745	819	893
VRPP 600	600	60.0	74.3	117	182	246	283	331	361	398	492	545	703	784	862	940
VRPP 624	624	62.4	77.3	121	189	256	294	345	375	414	511	567	732	816	897	978
VRPP 664	664	66.4	82.3	129	201	272	313	367	399	441	544	604	778	868	954	1041
VRPP 710	710	71.0	88.0	138	215	291	335	392	427	471	582	645	832	928	1020	1113
VRPP 728	728	72.8	90.2	141	220	298	343	402	438	483	597	662	853	952	1046	1141
VRPP 775	775	77.5	96.0	150	234	317	366	428	466	515	635	705	909	1013	1114	1215
VRPP 830	830	83.0	102.9	161	251	340	392	459	499	551	680	755	973	1085	1193	1301
VRPP 850	850	85.0	105.3	165	257	348	401	470	511	564	697	773	996	1111	1221	1332
VRPP 873	873	87.3	108.2	170	264	357	412	482	525	580	716	794	1023	1141	1254	1368



# Performance data

## Performance after prolonged float charge of fully charged cells

Available amperes at +20 ± 5 deg.C

End Voltage 1.14 V / Cell

Cell Type	C5Ah	Hours					Minutes					Seconds				
		10	8	5	3	2	90	60	45	30	10	5	60	30	10	1
VRPP 8	8	0.78	0.95	1.52	1.98	2.40	2.75	3.36	3.67	4.08	5.26	6.15	8.33	9.70	11.6	15.1
VRPP 12	12	1.17	1.43	2.28	2.96	3.60	4.12	5.04	5.50	6.12	7.89	9.23	12.5	14.5	17.3	22.7
VRPP 16	16	1.55	1.90	3.04	3.95	4.80	5.50	6.72	7.34	8.16	10.5	12.3	16.7	19.4	23.1	30.3
VRPP 18	18	1.75	2.14	3.42	4.44	5.41	6.19	7.56	8.26	9.18	11.8	13.8	18.8	21.8	26.0	34.0
VRPP 24	24	2.33	2.86	4.56	5.93	7.21	8.25	10.1	11.0	12.2	15.8	18.5	25.0	29.1	34.7	45.4
VRPP 27	27	2.62	3.21	5.13	6.67	8.11	9.28	11.3	12.4	13.8	17.8	20.8	28.1	32.7	39.0	51.0
VRPP 32	32	3.11	3.81	6.08	7.90	9.61	11.0	13.5	14.7	16.3	21.1	24.6	33.3	38.8	46.2	60.5
VRPP 36	36	3.50	4.29	6.84	8.89	10.8	12.4	15.1	16.5	18.4	23.7	27.7	37.5	43.6	52.0	68.1
VRPP 40	40	3.88	4.76	7.60	9.88	12.0	13.7	16.8	18.3	20.4	26.4	30.8	41.7	48.5	57.8	75.6
VRPP 45	45	4.37	5.36	8.56	11.1	13.5	15.5	18.9	20.6	23.0	29.6	34.6	46.9	54.5	65.0	85.1
VRPP 50	50	4.85	6.00	9.49	13.8	15.5	16.7	19.1	20.1	23.2	29.4	34.0	44.2	47.9	53.9	61.0
VRPP 57	57	5.53	6.84	10.8	15.7	17.6	19.0	21.8	22.9	26.5	33.5	38.8	50.4	54.6	61.4	69.5
VRPP 66	66	6.41	7.92	12.5	18.2	20.4	22.0	25.2	26.5	30.6	38.8	44.9	58.4	63.2	71.1	80.5
VRPP 71	71	6.89	8.52	13.5	19.5	22.0	23.7	27.1	28.5	33.0	41.8	48.5	62.9	68.0	76.5	86.7
VRPP 76	76	7.38	9.12	14.4	20.9	23.5	25.3	29.1	30.5	35.3	44.7	51.7	67.3	72.8	81.9	92.7
VRPP 82	82	7.96	9.84	15.6	22.6	25.4	27.3	31.4	32.9	38.1	48.2	55.8	72.6	78.5	88.4	100
VRPP 89	89	8.64	10.7	16.9	24.5	27.6	29.7	34.0	35.7	41.3	52.4	60.6	78.8	85.2	95.9	109
VRPP 95	95	9.22	11.4	18.0	26.1	29.4	31.7	36.3	38.2	44.1	55.9	64.8	84.2	91.0	102	116
VRPP 103	103	10.0	12.4	19.5	28.3	31.9	34.3	39.4	41.4	47.8	60.6	70.1	91.2	98.7	111	126
VRPP 111	111	10.8	13.3	21.1	30.5	34.4	37.0	42.4	44.6	51.5	65.3	75.6	98.2	106	120	135
VRPP 119	119	11.6	14.3	22.6	32.7	36.9	39.7	45.5	47.8	55.2	70.0	81.2	105	114	128	145
VRPP 133	133	12.9	16.0	25.2	36.6	41.2	44.3	50.9	53.4	61.7	78.2	90.5	118	127	143	162
VRPP 142	142	13.8	17.1	27.0	39.0	44.0	47.3	54.3	57.0	65.9	83.5	96.9	126	136	153	173
VRPP 155	155	15.0	18.6	29.4	42.7	48.0	51.7	59.3	62.2	72.0	91.2	106	137	148	167	189
VRPP 166	166	16.1	19.9	31.5	45.6	51.4	55.3	63.5	66.7	77.1	97.6	113	147	159	179	203
VRPP 178	178	17.3	21.4	33.8	49.0	55.1	59.3	68.1	71.5	82.6	105	121	158	170	192	217
VRPP 190	190	18.5	22.8	36.1	52.2	58.8	63.3	72.6	76.3	88.2	112	130	168	182	205	232
VRPP 206	206	20.0	24.7	39.1	56.7	63.8	68.7	78.8	82.7	95.6	121	140	182	197	222	251
VRPP 222	222	21.6	26.7	42.1	61.1	68.7	74.0	84.9	89.2	103	131	151	196	213	239	271
VRPP 238	238	23.1	28.6	45.2	65.4	73.7	79.3	91.0	95.6	110	140	162	211	228	256	291
VRPP 266	266	25.8	31.9	50.5	73.2	82.4	88.7	102	107	123	156	181	235	255	287	324
VRPP 285	285	27.7	34.2	54.1	78.3	88.2	95.0	109	114	132	168	194	252	273	307	348
VRPP 310	310	30.1	37.2	58.8	85.3	96.0	103	119	124	144	182	211	274	297	334	378
VRPP 332	332	32.2	39.9	63.0	91.4	103	111	127	133	154	195	226	294	318	358	405
VRPP 357	357	34.8	42.9	67.8	98.1	111	119	137	143	166	210	244	316	342	385	435
VRPP 370	370	35.9	44.4	70.2	102	115	123	141	149	172	218	252	327	354	399	451
VRPP 400	400	38.8	48.0	75.9	110	124	133	153	161	186	235	272	354	383	431	488
VRPP 426	426	41.4	51.3	80.9	117	132	142	163	171	198	251	291	378	408	459	520
VRPP 438	438	42.5	52.6	83.1	121	136	146	167	176	203	258	298	388	420	472	534
VRPP 476	476	46.2	57.2	90.4	131	147	159	182	191	221	280	324	422	456	513	582
VRPP 498	498	48.3	59.8	94.5	137	154	166	190	200	231	293	339	441	477	537	607
VRPP 530	530	51.5	63.6	101	146	164	177	203	213	246	312	361	469	508	571	646
VRPP 570	570	55.3	68.4	108	157	176	190	218	229	265	335	388	504	546	614	695
VRPP 600	600	58.3	72.0	114	165	186	200	229	241	279	353	408	531	575	647	732
VRPP 624	624	60.6	74.9	118	172	193	208	239	251	290	367	425	552	598	672	761
VRPP 664	664	64.5	79.7	126	183	206	221	254	267	308	391	452	588	636	716	810
VRPP 710	710	68.9	85.2	135	195	220	237	271	285	330	418	483	628	680	765	866
VRPP 728	728	70.7	87.4	138	200	225	243	278	292	338	428	496	644	697	784	888
VRPP 775	775	75.2	93.0	147	213	240	258	296	311	360	456	528	686	742	835	945
VRPP 830	830	80.6	99.6	157	228	257	277	317	333	385	488	565	735	795	894	1012
VRPP 850	850	82.5	102.0	161	234	263	283	325	341	395	500	579	752	814	916	1037
VRPP 873	873	84.8	104.8	166	240	270	291	334	351	405	514	594	773	836	941	1065

# Performance data

## Performance after prolonged float charge of fully charged cells

Available watts at +20 ± 5 deg.C

End Voltage 1.00 V / Cell

Cell Type	C5Ah	Hours					Minutes					Seconds				
		10	8	5	3	2	90	60	45	30	10	5	60	30	10	1
VRPP 8	8	0.98	1.21	1.87	2.82	4.03	4.94	6.31	7.05	8.11	10.9	12.2	16.2	17.9	21.1	25.5
VRPP 12	12	1.47	1.82	2.80	4.23	6.04	7.41	9.47	10.6	12.2	16.4	18.4	24.2	26.8	31.6	38.2
VRPP 16	16	1.96	2.42	3.73	5.64	8.05	9.88	12.6	14.1	16.2	21.8	24.5	32.3	35.7	42.2	51.0
VRPP 18	18	2.21	2.72	4.20	6.34	9.06	11.1	14.2	15.9	18.3	24.6	27.5	36.4	40.2	47.4	57.3
VRPP 24	24	2.94	3.63	5.60	8.45	12.1	14.8	18.9	21.2	24.3	32.8	36.7	48.5	53.6	63.2	76.5
VRPP 27	27	3.31	4.08	6.30	9.50	13.6	16.7	21.3	23.8	27.4	36.8	41.3	54.5	60.3	71.1	86.0
VRPP 32	32	3.93	4.84	7.47	11.3	16.1	19.8	25.2	28.2	32.4	43.7	49.0	64.6	71.4	84.3	102
VRPP 36	36	4.42	5.45	8.40	12.7	18.1	22.2	28.4	31.7	36.5	49.1	55.1	72.7	80.4	94.9	115
VRPP 40	40	4.91	6.05	9.34	14.1	20.1	24.7	31.6	35.3	40.6	54.6	61.2	80.8	89.3	105	128
VRPP 45	45	5.52	6.71	10.5	15.9	22.6	27.8	35.5	39.7	45.6	61.4	68.8	90.9	100	119	143
VRPP 50	50	6.05	7.46	11.7	18.0	25.4	30.9	39.4	44.3	50.5	66.4	70.6	86.8	95	108	126
VRPP 57	57	6.90	8.50	13.3	20.5	29.0	35.2	45.0	50.5	57.6	75.7	80.5	99.0	108	123	143
VRPP 66	66	7.98	9.8	15.4	23.7	33.6	40.8	52.1	58.4	66.7	87.7	93.2	115	125	142	166
VRPP 71	71	8.59	10.6	16.6	25.5	36.1	43.9	56.0	62.9	71.8	94.3	100	123	134	153	179
VRPP 76	76	9.19	11.3	17.7	27.3	38.6	46.9	60.0	67.3	76.8	101	107	132	144	164	191
VRPP 82	82	9.9	12.2	19.1	29.5	41.7	50.6	64.7	72.6	82.9	109	116	142	155	177	206
VRPP 89	89	10.8	13.3	20.8	32.0	45.2	55.0	70.2	78.8	90.0	118	126	155	168	192	224
VRPP 95	95	11.5	14.2	22.2	34.2	48.3	58.7	74.9	84.1	96.0	126	134	165	180	205	239
VRPP 103	103	12.5	15.4	24.0	37.0	52.4	63.6	81.2	91.2	104	137	145	179	195	222	259
VRPP 111	111	13.4	16.6	25.9	39.9	56.4	68.6	87.6	98.3	112	147	157	193	210	239	279
VRPP 119	119	14.4	17.8	27.8	42.7	60.5	73.5	93.9	105	120	158	168	207	225	256	299
VRPP 133	133	16.1	19.8	31.0	47.8	67.6	82.1	105	118	134	177	188	231	251	287	334
VRPP 142	142	17.2	21.2	33.1	51.0	72.2	87.7	112	126	144	189	201	247	269	306	357
VRPP 155	155	18.8	23.1	36.2	55.7	78.8	95.7	122	137	157	206	219	269	293	334	389
VRPP 166	166	20.1	24.8	38.7	59.7	84.4	103	131	147	168	221	235	288	314	358	417
VRPP 178	178	21.6	26.6	41.5	63.9	90.5	110	140	158	180	236	251	309	336	384	447
VRPP 190	190	23.0	28.3	44.3	68.2	96.6	117	150	168	192	252	268	330	359	409	478
VRPP 206	206	25.0	30.7	48.1	74.0	105	127	162	182	208	274	291	358	389	444	518
VRPP 222	222	26.9	33.1	51.8	79.7	113	137	175	197	224	295	314	385	420	478	558
VRPP 238	238	28.9	35.5	55.5	85.5	121	147	188	211	241	316	336	413	450	513	598
VRPP 266	266	32.3	39.7	62.1	95.5	135	164	210	235	269	353	376	462	503	573	668
VRPP 285	285	34.6	42.5	66.5	102	145	176	225	252	288	379	403	495	539	614	717
VRPP 310	310	37.6	46.2	72.4	111	158	191	245	274	313	412	438	538	586	668	779
VRPP 332	332	40.3	49.5	77.5	119	169	205	262	294	336	441	469	576	628	716	834
VRPP 357	357	43.2	53.3	83.3	128	181	221	282	316	362	474	504	621	675	769	897
VRPP 370	370	44.9	55.2	86.4	133	188	229	292	328	374	492	523	642	699	797	930
VRPP 400	400	48.5	59.7	93.4	144	203	247	316	354	404	531	565	694	756	862	1005
VRPP 426	426	51.7	63.6	99.4	153	217	263	337	377	432	566	603	741	807	918	1071
VRPP 438	438	53.2	65.3	102	157	223	271	346	388	443	582	619	760	828	944	1101
VRPP 476	476	57.8	71.0	111	171	243	294	375	421	481	632	672	826	900	1026	1196
VRPP 498	498	60.5	74.3	116	179	253	308	393	441	503	662	703	865	941	1073	1251
VRPP 530	530	64.4	79.1	124	190	269	327	418	469	536	704	749	920	1002	1142	1332
VRPP 570	570	69.2	85.0	133	205	290	352	450	505	576	757	805	990	1078	1228	1432
VRPP 600	600	72.9	89.5	140	215	305	371	473	531	607	797	847	1042	1134	1293	1508
VRPP 624	624	75.8	93.1	146	224	317	385	492	552	631	829	881	1083	1180	1345	1568
VRPP 664	664	80.6	99.1	155	238	338	410	524	588	671	882	938	1153	1255	1431	1668
VRPP 710	710	86.2	106	166	255	361	439	560	629	718	943	1003	1233	1342	1530	1784
VRPP 728	728	88.4	109	170	261	370	450	574	644	736	967	1028	1264	1376	1569	1829
VRPP 775	775	94.1	116	181	278	394	479	611	686	783	1030	1095	1345	1465	1670	1947
VRPP 830	830	101	124	194	298	422	513	655	735	839	1103	1172	1441	1569	1789	2085
VRPP 850	850	103	127	198	305	432	525	671	752	859	1129	1201	1476	1607	1832	2136
VRPP 873	873	106	130	204	314	444	539	689	773	883	1160	1233	1516	1650	1881	2193

# Performance data

## Performance after prolonged float charge of fully charged cells

Available watts at +20 ± 5 deg.C

End Voltage 1.05 V / Cell

Cell Type	C5Ah	Hours					Minutes					Seconds				
		10	8	5	3	2	90	60	45	30	10	5	60	30	10	1
VRPP 8	8	0.95	1.19	1.85	2.84	3.89	4.69	5.84	6.32	6.84	8.96	10.4	13.9	15.7	18.4	23.2
VRPP 12	12	1.43	1.78	2.77	4.26	5.83	7.04	8.76	9.48	10.3	13.4	15.5	20.9	23.6	27.6	34.8
VRPP 16	16	1.91	2.37	3.70	5.68	7.77	9.38	11.7	12.6	13.7	17.9	20.7	27.9	31.4	36.8	46.4
VRPP 18	18	2.15	2.67	4.16	6.39	8.75	10.6	13.1	14.2	15.4	20.2	23.3	31.3	35.3	41.4	52.2
VRPP 24	24	2.86	3.56	5.55	8.52	11.7	14.1	17.5	19.0	20.5	26.9	31.1	41.8	47.1	55.1	69.6
VRPP 27	27	3.22	4.00	6.24	9.6	13.1	15.8	19.7	21.3	23.1	30.2	35.0	47.0	53.0	62.0	78.3
VRPP 32	32	3.82	4.74	7.39	11.4	15.5	18.8	23.4	25.3	27.4	35.8	41.4	55.7	62.8	73.5	92.8
VRPP 36	36	4.29	5.33	8.32	12.8	17.5	21.1	26.3	28.4	30.8	40.3	46.6	62.7	70.7	82.7	104
VRPP 40	40	4.89	5.93	9.24	14.2	19.4	23.5	29.2	31.6	34.2	44.8	51.8	69.7	78.5	91.9	117
VRPP 45	45	5.37	6.67	10.4	16.0	21.9	26.4	32.8	35.6	38.5	50.4	58.3	78.4	88.3	103	131
VRPP 50	50	6.01	7.40	11.6	18.0	25.2	29.2	35.1	38.8	44.5	55.4	61.5	78.5	84.3	94.0	110
VRPP 57	57	6.85	8.43	13.2	20.6	28.7	33.3	40.0	44.2	50.8	63.2	70.2	89.5	96.1	107	126
VRPP 66	66	7.93	9.8	15.3	23.8	33.2	38.6	46.3	51.2	58.8	73.2	81.2	104	111	124	145
VRPP 71	71	8.53	10.5	16.5	25.6	35.8	41.5	49.7	55.0	63.2	78.8	87.5	112	120	134	156
VRPP 76	76	9.13	11.2	17.7	27.4	38.3	44.4	53.3	58.9	67.7	84.2	93.6	119	128	143	167
VRPP 82	82	9.85	12.1	19.1	29.6	41.3	47.9	57.5	63.6	73.0	90.9	101	129	138	155	181
VRPP 89	89	10.7	13.2	20.7	32.1	44.8	52.0	62.4	69.0	79.3	98.6	110	140	150	168	196
VRPP 95	95	11.4	14.1	22.1	34.3	47.8	55.5	66.5	73.6	84.6	105	117	149	160	179	209
VRPP 103	103	12.4	15.2	23.9	37.2	51.9	60.2	72.2	79.8	91.7	114	127	162	174	194	227
VRPP 111	111	13.3	16.4	25.8	40.0	55.9	64.9	77.8	86.0	98.9	123	137	174	187	209	245
VRPP 119	119	14.3	17.6	27.7	42.9	59.9	69.6	83.2	92.2	106	132	146	187	201	224	262
VRPP 133	133	16.0	19.7	30.9	48.0	67.0	77.8	93.3	103	118	147	164	209	224	251	293
VRPP 142	142	17.1	21.0	33.0	51.2	71.5	83.1	99.3	110	126	158	175	224	239	268	313
VRPP 155	155	18.6	22.9	36.0	55.9	78.1	90.6	109	120	138	172	191	243	261	292	342
VRPP 166	166	19.9	24.6	38.6	59.9	83.6	97.1	116	129	148	184	204	261	280	313	366
VRPP 178	178	21.4	26.3	41.4	64.2	89.7	104	125	138	159	197	219	280	300	336	392
VRPP 190	190	22.9	28.1	44.2	68.5	95.7	111	133	147	169	211	234	298	320	358	418
VRPP 206	206	24.7	30.5	47.9	74.3	104	120	144	160	183	228	254	324	347	388	454
VRPP 222	222	26.7	32.8	51.6	80.1	112	130	156	172	198	246	273	349	374	418	489
VRPP 238	238	28.6	35.2	55.3	85.9	120	139	166	184	212	264	293	374	401	449	524
VRPP 266	266	32.0	39.4	61.8	96.0	134	156	187	206	237	295	327	418	448	501	586
VRPP 285	285	34.2	42.2	66.3	103	144	167	200	221	254	316	351	448	480	537	627
VRPP 310	310	37.2	45.9	72.1	112	156	181	217	240	276	344	382	487	522	584	683
VRPP 332	332	39.9	49.1	77.2	120	167	194	233	257	296	368	409	521	560	626	732
VRPP 357	357	42.9	53.0	83.0	129	180	209	250	277	318	396	441	561	602	673	786
VRPP 370	370	44.5	54.7	86.0	133	186	216	259	287	330	410	455	581	624	697	815
VRPP 400	400	48.1	59.2	93.0	144	201	234	281	310	356	443	492	628	674	754	881
VRPP 426	426	51.2	63.0	99.1	154	215	249	299	330	379	474	526	671	718	803	939
VRPP 438	438	52.6	64.8	102	158	221	256	307	339	390	485	539	688	738	826	965
VRPP 476	476	57.2	70.4	111	172	240	278	333	369	424	528	586	748	802	897	1048
VRPP 498	498	59.8	73.7	116	180	251	291	349	386	444	552	613	782	839	939	1097
VRPP 530	530	63.7	78.4	123	191	267	310	372	411	472	587	652	832	893	999	1168
VRPP 570	570	68.5	84.3	132	206	287	333	400	442	508	632	702	895	961	1075	1256
VRPP 600	600	72.1	88.8	139	216	302	351	421	465	534	665	739	942	1011	1131	1322
VRPP 624	624	75.0	92.3	145	225	314	365	438	484	556	692	768	980	1052	1176	1375
VRPP 664	664	79.8	98.2	154	240	334	388	466	515	591	736	817	1043	1119	1252	1463
VRPP 710	710	85.3	105	165	256	358	415	498	550	632	787	874	1115	1197	1338	1565
VRPP 728	728	87.5	108	169	263	367	426	511	564	648	807	896	1143	1227	1372	1604
VRPP 775	775	93.1	115	180	280	390	453	544	601	690	859	954	1217	1306	1461	1708
VRPP 830	830	100	123	193	299	418	485	582	643	739	920	1022	1304	1399	1565	1829
VRPP 850	850	102	126	198	307	428	497	596	659	757	942	1046	1335	1433	1602	1873
VRPP 873	873	105	129	203	315	440	510	612	677	778	968	1075	1371	1471	1646	1924

# Performance data

## Performance after prolonged float charge of fully charged cells

Available watts at +20 ± 5 deg.C

End Voltage 1.10 V / Cell

Cell Type	C5Ah	Hours					Minutes					Seconds				
		10	8	5	3	2	90	60	45	30	10	5	60	30	10	1
VRPP 8	8	0.96	1.18	1.82	2.60	3.36	3.94	4.92	5.29	5.82	7.16	8.32	11.6	13.1	15.5	19.6
VRPP 12	12	1.43	1.78	2.73	3.90	5.04	5.91	7.39	7.93	8.74	10.7	12.5	17.4	19.6	23.3	29.5
VRPP 16	16	1.91	2.37	3.65	5.20	6.72	7.87	9.8	10.6	11.6	14.3	16.6	23.2	26.2	31.0	39.3
VRPP 18	18	2.15	2.66	4.10	5.86	7.56	8.86	11.1	11.9	13.1	16.1	18.7	26.1	29.5	34.9	44.2
VRPP 24	24	2.87	3.55	5.47	7.81	10.1	11.8	14.8	15.9	17.5	21.5	25.0	34.8	39.3	46.6	58.9
VRPP 27	27	3.22	4.00	6.15	8.78	11.3	13.3	16.6	17.8	19.7	24.2	28.1	39.2	44.2	52.4	66.3
VRPP 32	32	3.82	4.74	7.29	10.4	13.4	15.7	19.7	21.2	23.3	28.7	33.3	46.4	52.4	62.1	78.6
VRPP 36	36	4.30	5.33	8.20	11.7	15.1	17.7	22.2	23.8	26.2	32.2	37.4	52.2	58.9	69.8	88.4
VRPP 40	40	4.78	5.92	9.12	13.0	16.8	19.7	24.6	26.4	29.2	35.8	41.6	58.0	65.5	77.6	98.2
VRPP 45	45	5.37	6.66	10.3	14.6	18.9	22.1	27.7	29.7	32.8	40.3	46.8	65.3	73.7	87.3	110
VRPP 50	50	5.97	7.35	11.4	17.3	23.1	26.5	30.8	33.4	36.7	45.1	50.0	64.5	71.9	79.0	86.2
VRPP 57	57	6.81	8.38	13.0	19.7	26.4	30.2	35.1	38.1	41.9	51.5	57.0	73.5	82.0	90.1	98.3
VRPP 66	66	7.88	9.71	15.1	22.9	30.5	34.9	40.6	44.1	48.5	59.6	66.0	85.1	94.9	104	114
VRPP 71	71	8.48	10.4	16.2	24.6	32.9	37.6	43.7	47.4	52.2	64.2	71.1	91.6	102	112	122
VRPP 76	76	9.07	11.2	17.4	26.3	35.2	40.2	46.8	50.8	55.8	68.6	76.0	98.0	109	120	131
VRPP 82	82	9.8	12.1	18.7	28.4	37.9	43.4	50.5	54.8	60.2	74.0	82.0	106	118	130	141
VRPP 89	89	10.6	13.1	20.3	30.8	41.2	47.1	54.8	59.4	65.4	80.4	89.0	115	128	141	153
VRPP 95	95	11.3	14.0	21.7	33.0	44.0	50.3	58.3	63.4	69.8	85.9	95.0	123	137	150	164
VRPP 103	103	12.3	15.2	23.5	35.7	47.7	54.5	63.4	68.8	75.7	93.0	103	133	148	163	178
VRPP 111	111	13.3	16.3	25.3	38.5	51.4	58.7	68.3	74.1	81.6	100	111	143	160	175	191
VRPP 119	119	14.2	17.5	27.2	41.2	55.1	63.0	73.1	79.5	87.5	108	119	153	171	188	205
VRPP 133	133	15.9	19.6	30.4	46.1	61.5	70.4	81.9	88.8	97.7	120	133	172	191	210	229
VRPP 142	142	17.0	20.9	32.4	49.2	65.7	75.2	87.2	94.8	104	129	142	183	204	224	245
VRPP 155	155	18.5	22.8	35.4	53.7	71.7	82.0	95.4	104	114	140	155	200	223	245	267
VRPP 166	166	19.8	24.4	37.9	57.5	76.8	87.9	102	111	122	150	166	214	239	262	286
VRPP 178	178	21.3	26.2	40.6	61.7	82.4	94.2	110	119	131	161	178	230	256	281	307
VRPP 190	190	22.7	27.9	43.4	65.8	87.8	101	117	127	140	172	190	245	273	300	328
VRPP 206	206	24.6	30.3	47.0	71.4	95.3	109	127	138	151	186	206	266	296	326	355
VRPP 222	222	26.5	32.7	50.7	76.9	103	117	137	148	163	200	222	286	319	351	383
VRPP 238	238	28.4	35.0	54.3	82.5	110	126	146	159	175	215	238	307	342	376	410
VRPP 266	266	31.8	39.1	60.7	92.2	123	141	164	178	195	240	266	343	382	420	459
VRPP 285	285	34.0	41.9	65.1	98.8	132	151	175	190	209	257	285	368	410	450	491
VRPP 310	310	37.0	45.6	70.8	107	143	164	191	207	228	280	310	400	446	490	534
VRPP 332	332	39.6	48.8	75.8	115	154	176	204	222	244	300	332	428	477	525	572
VRPP 357	357	42.6	52.5	81.5	124	165	189	220	238	262	322	357	462	513	564	616
VRPP 370	370	44.2	54.4	84.5	128	171	196	228	247	272	334	370	477	532	585	638
VRPP 400	400	47.8	58.8	91.3	139	185	212	246	267	294	361	400	516	575	632	690
VRPP 426	426	50.9	62.7	97.3	148	197	225	262	284	313	387	426	551	613	673	736
VRPP 438	438	52.3	64.4	100	152	203	232	270	292	322	395	438	565	630	692	755
VRPP 476	476	56.8	70.0	109	165	220	252	292	318	350	430	476	614	684	752	821
VRPP 498	498	59.5	73.2	114	173	230	264	307	333	366	450	498	642	716	787	859
VRPP 530	530	63.3	78.0	121	184	245	281	326	354	389	479	530	683	762	838	914
VRPP 570	570	68.1	83.8	130	197	264	302	351	381	419	515	570	735	820	901	983
VRPP 600	600	71.6	88.3	137	208	278	318	369	401	441	542	600	774	863	948	1034
VRPP 624	624	74.5	91.8	142	216	289	330	384	417	458	563	624	805	897	986	1076
VRPP 664	664	79.3	97.7	152	230	307	351	409	443	488	600	664	856	955	1049	1145
VRPP 710	710	84.8	104	162	246	329	376	437	474	522	641	710	916	1021	1122	1224
VRPP 728	728	86.9	107	166	252	337	385	448	486	535	657	728	939	1047	1151	1255
VRPP 775	775	92.5	114	177	268	359	410	477	518	569	700	775	999	1114	1225	1336
VRPP 830	830	99.1	122	190	288	384	439	511	554	610	749	830	1070	1193	1312	1431
VRPP 850	850	101	125	194	294	393	450	523	568	625	767	850	1096	1222	1343	1466
VRPP 873	873	104	128	199	302	404	462	537	583	641	788	873	1126	1255	1380	1505



# Performance data

## Performance after prolonged float charge of fully charged cells

Available watts at +20 ± 5 deg.C

End Voltage 1.14 V / Cell

Cell Type	C5Ah	Hours					Minutes						Seconds			
		10	8	5	3	2	90	60	45	30	10	5	60	30	10	1
VRPP 8	8	0.93	1.13	1.79	2.30	2.78	3.17	3.86	4.20	4.67	6.00	7.02	9.50	11.1	13.2	17.2
VRPP 12	12	1.39	1.70	2.69	3.45	4.17	4.75	5.78	6.30	7.00	9.01	10.5	14.3	16.6	19.8	25.9
VRPP 16	16	1.86	2.26	3.59	4.60	5.55	6.33	7.71	8.40	9.33	12.0	14.0	19.0	22.1	26.4	34.5
VRPP 18	18	2.09	2.55	4.04	5.17	6.25	7.12	8.68	9.45	10.5	13.5	15.8	21.4	24.9	29.7	38.8
VRPP 24	24	2.78	3.40	5.38	6.89	8.33	9.50	11.6	12.6	14.0	18.0	21.0	28.5	33.2	39.5	51.7
VRPP 27	27	3.13	3.82	6.05	7.76	9.37	10.7	13.0	14.2	15.8	20.3	23.7	32.1	37.3	44.5	58.2
VRPP 32	32	3.71	4.53	7.18	9.19	11.1	12.7	15.5	16.8	18.7	24.0	28.1	38.0	44.2	52.7	69.0
VRPP 36	36	4.18	5.09	8.07	10.3	12.5	14.2	17.4	18.9	21.0	27.0	31.6	42.8	49.7	59.3	77.6
VRPP 40	40	4.64	5.66	8.97	11.5	13.9	15.8	19.3	21.0	23.3	30.1	35.1	47.5	55.3	65.9	86.2
VRPP 45	45	5.22	6.37	10.1	12.9	15.6	17.8	21.7	23.6	26.3	33.8	39.5	53.4	62.2	74.1	97.0
VRPP 50	50	5.80	7.13	11.2	16.0	17.9	19.2	21.9	23.0	26.5	33.6	38.8	50.4	54.6	61.4	69.5
VRPP 57	57	6.61	8.13	12.8	18.2	20.4	21.9	25.0	26.2	30.3	38.2	44.2	57.5	62.2	70.0	79.2
VRPP 66	66	7.66	9.42	14.8	21.1	23.6	25.3	29.0	30.3	35.0	44.3	51.2	66.6	72.1	81.1	91.8
VRPP 71	71	8.24	10.1	15.9	22.7	25.4	27.2	31.1	32.6	37.7	47.6	55.2	71.8	77.5	87.2	98.8
VRPP 76	76	8.82	10.8	17.0	24.3	27.2	29.2	33.3	34.9	40.3	51.0	59.0	76.7	83.0	93.4	106
VRPP 82	82	9.51	11.7	18.4	26.3	29.3	31.5	36.0	37.7	43.5	55.0	63.6	82.7	89.5	101	114
VRPP 89	89	10.3	12.7	19.9	28.5	31.9	34.2	39.0	40.9	47.2	59.7	69.1	89.8	97.2	109	124
VRPP 95	95	11.0	13.6	21.3	30.4	34.0	36.5	41.7	43.7	50.4	63.7	73.9	96.0	104	117	132
VRPP 103	103	12.0	14.7	23.1	33.0	36.9	39.5	45.2	47.4	54.7	69.1	79.9	104	112	127	143
VRPP 111	111	12.9	15.8	24.8	35.5	39.7	42.6	48.7	51.0	58.9	74.5	86.1	112	121	136	154
VRPP 119	119	13.8	17.0	26.6	38.1	42.7	45.7	52.2	54.7	63.2	79.8	92.6	120	130	146	165
VRPP 133	133	15.4	19.0	29.8	42.6	47.6	51.0	58.3	61.2	70.6	89.2	103	134	145	163	185
VRPP 142	142	16.5	20.3	31.8	45.4	50.8	54.5	62.3	65.3	75.4	95.3	110	143	155	174	197
VRPP 155	155	18.0	22.1	34.7	49.6	55.5	59.5	68.0	71.3	82.3	104	120	156	169	190	215
VRPP 166	166	19.3	23.7	37.2	53.1	59.4	63.7	72.8	76.3	88.1	111	129	167	181	204	231
VRPP 178	178	20.7	25.4	39.8	57.0	63.7	68.3	78.1	81.9	94.5	119	138	180	194	219	247
VRPP 190	190	22.1	27.1	42.5	60.7	68.0	72.9	83.3	87.4	101	127	148	192	207	233	264
VRPP 206	206	23.9	29.4	46.1	66.0	73.7	79.1	90.4	94.7	109	138	160	208	225	253	286
VRPP 222	222	25.8	31.7	49.7	71.1	79.5	85.2	97.4	102	118	149	172	224	242	273	309
VRPP 238	238	27.6	34.0	53.3	76.1	85.2	91.3	104	109	126	160	185	240	260	292	332
VRPP 266	266	30.9	38.0	59.5	85.2	95.2	102	117	122	141	178	206	268	290	327	370
VRPP 285	285	33.1	40.7	63.8	91.1	102	109	125	131	151	191	221	288	311	350	396
VRPP 310	310	36.0	44.2	69.4	99.3	111	119	136	143	165	208	241	313	339	381	431
VRPP 332	332	38.5	47.4	74.3	106	119	127	146	153	176	223	258	335	363	408	462
VRPP 357	357	41.4	50.9	80.0	114	128	137	157	164	190	240	278	360	390	439	496
VRPP 370	370	42.9	52.8	82.8	118	132	142	162	170	196	248	287	373	404	455	514
VRPP 400	400	46.4	57.1	89.5	128	143	154	175	184	212	268	310	404	437	491	556
VRPP 426	426	49.4	61.0	95.4	136	152	163	187	196	226	286	331	431	465	523	592
VRPP 438	438	50.8	62.5	98.0	140	157	168	192	201	233	294	340	442	478	538	609
VRPP 476	476	55.2	68.0	107	152	170	183	209	219	253	319	369	481	520	585	663
VRPP 498	498	57.8	71.1	111	159	178	191	218	229	264	334	386	502	544	612	692
VRPP 530	530	61.5	75.6	119	170	190	203	232	244	281	356	411	535	579	651	737
VRPP 570	570	66.1	81.3	128	182	204	219	250	262	303	382	442	575	622	700	792
VRPP 600	600	69.6	85.6	134	192	215	230	263	276	318	403	466	605	655	737	834
VRPP 624	624	72.4	89.0	140	200	223	239	274	287	331	419	484	630	681	767	868
VRPP 664	664	77.0	94.7	149	213	238	255	291	305	352	446	515	670	725	816	923
VRPP 710	710	82.4	101	159	227	254	272	311	326	377	476	551	716	775	872	987
VRPP 728	728	84.5	104	163	233	261	279	319	335	386	488	565	734	795	894	1012
VRPP 775	775	89.9	111	173	248	277	297	340	356	411	520	601	782	846	952	1077
VRPP 830	835	96.3	118	186	266	297	319	364	382	441	557	644	837	906	1020	1154
VRPP 850	850	98.6	121	190	272	304	326	373	391	451	570	660	858	926	1044	1182
VRPP 873	873	101	125	195	280	312	335	383	401	463	586	677	881	953	1072	1214

# Battery arrangement as per rack design

CONT. REF	2 STEP		1 TIER 3 STEP		4 STEP		2 STEP		2 TIER 3STEP		4 STEP	
	W	H	W	H	W	H	W	H	W	H	W	H
B21/B22/B23/B24-1	296	703	434	818	572	933			434	1450	572	1700
B45-1,B44-1,B42A-1,B41B-1,B44-2, B42A-2,B42-2,B41B-2,B42A-3	440	844	650	959	860	1074	440	1550	650	1800	860	2050
B42-3	458	844	677	959	896	1074	458	1550	677	1800	896	2050
B41B-3	534	844	791	959			534	1550	791	1800		
B42-4	578	844	857	959			578	1550	857	1800		
B42A-5	636	844					636	1550				
B41B-4	680	844					680	1550				
B42-5	698	844					698	1550				
B41B-5	826	844					826	1550				
B41B-6	972	844					972	1550				

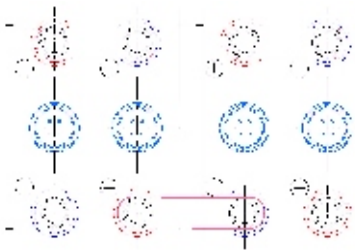
### EVALUATION OF LENGTH:

LENGTH OF RACK = (X + 5) x NO. OF BLOCK CELLS IN A ROW (FOR ALL BLOCK CELLS)

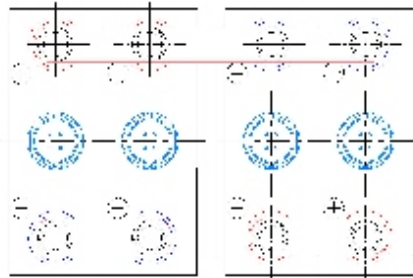
Where x = Length of Cell / Block cell for Row-wise mounting ( i.e. For VRPP 8 TO VRPP 357)  
 = width of cell or block cell for cross-wise mounting ( i.e. For VRPP 370 TO VRPP 873)

THE VALUE OF LENGTH SHOULD BE ROUNDED-OFF TO NEAREST to 50 mm AND 5mm SHOULD BE ADDED.

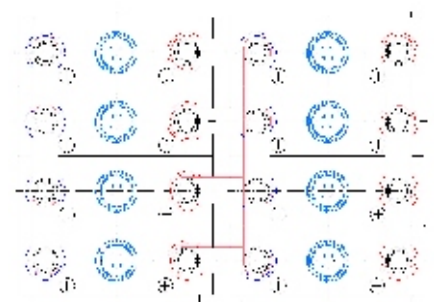
### VRPP 8 - 166 Ah



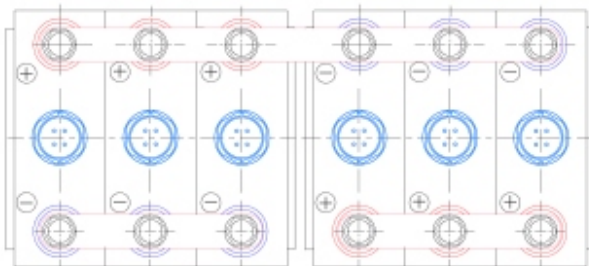
### VRPP 178 - 332



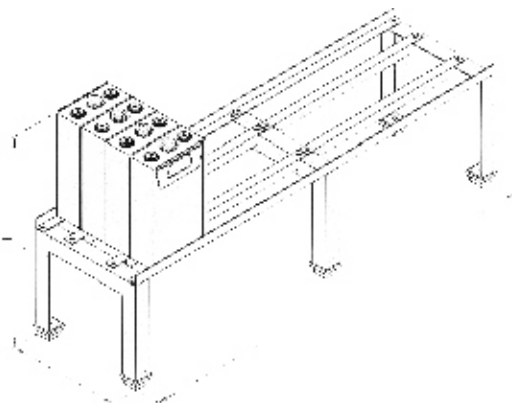
### VRPP 370 AND ABOVE



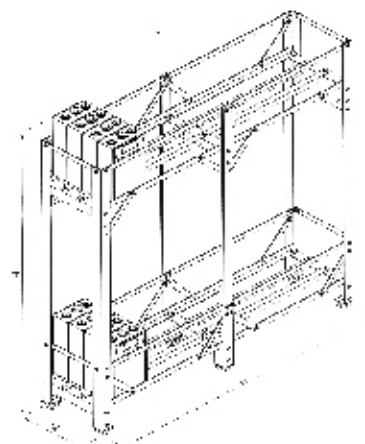
### VRPP 357



1 step, 1 tier rack

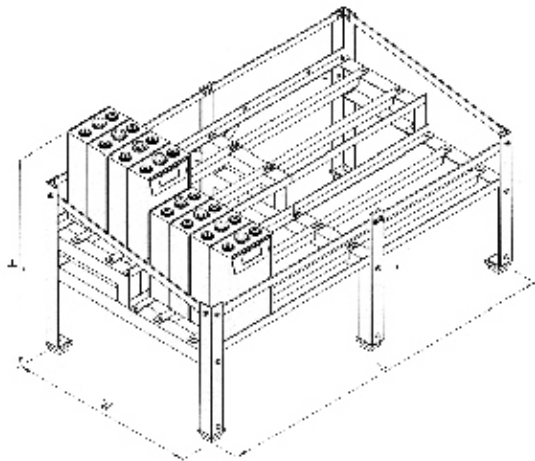


1 step, 2 tier rack

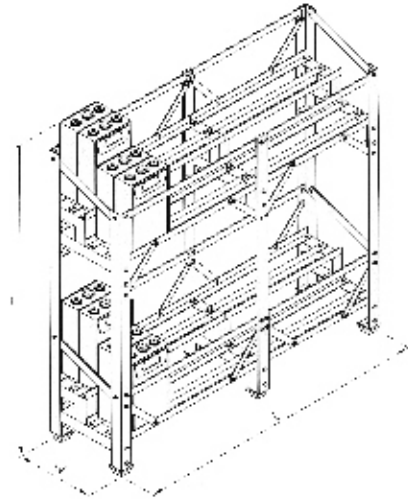




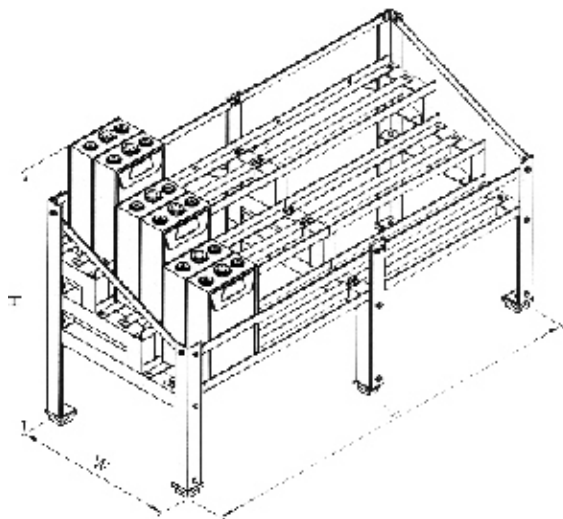
2 step, 1 tier rack



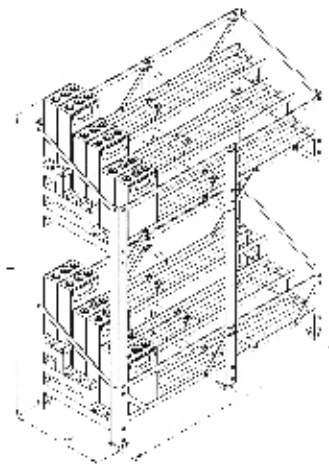
2 step, 2 tier rack



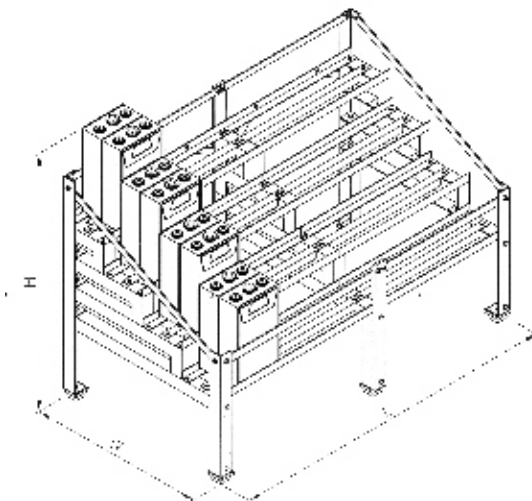
3 step, 1 tier rack



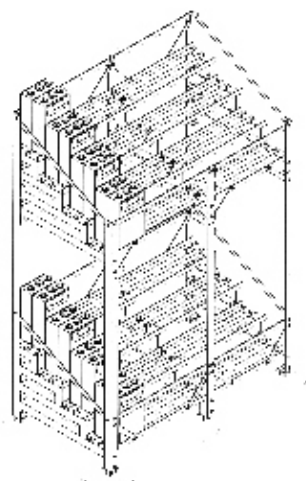
3 step, 2 tier rack



4 step, 1 tier rack



4 step, 2 tier rack





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