100 YEARS

Solar Range
Ni-Cd batteries

Reliability inside

ALCAD

ADVANCED SOLUTIONS |ENGINEERING EXCELLENCE

Low maintenance Ni-Cd batteries for renewable energy applications and stand-alone hybrid systems

Battery systems have a difficult job maintaining reliable service in isolated locations and hostile environments. Demands upon them fluctuate widely and charging depends entirely on irregular and unpredictable weather patterns.

For renewable energy applications

In remote outdoor installations, Alcad Solar is the natural choice for:

- Photovoltaic applications
- Stand-alone hybrid systems
- Renewable energy applications

The solution is Alcad Solar

Alcad Solar storage batteries are purpose built to operate in these conditions. The range provides totally reliable service and very low maintenance which achieves a low life-cycle cost.

Efficient and reliable in tough conditions

Managing complex charging patterns is essential for efficient running of a hybrid system. Alcad Solar will continue to operate at any state of charge.

Over-compensation for unpredictable charging conditions with high charging voltages is unnecessary.

Alcad Solar's typical charging voltage of 1.5 V per cell minimises water-consumption, eliminating unscheduled service calls. The battery reaches a high state of charge without boost or reconditioning charges.

Alcad Solar range Ni-Cd batteries are compatible with all current photovoltaic charge regulators and conventional industrial battery chargers.

Extreme operating temperature

Alcad Solar's robust construction and stable electrochemistry enable it to operate comfortably within a temperature range of −20°C (−4°F) to +50°C (+122°F) and will tolerate extremes of −50°C (−58°F) to +70°C (+158°F). For operation in temperatures below −20°C (−4°F), a special, higher density electrolyte is used.

Alcad Solar will deliver 80% capacity for a 120-hour discharge even at −40°C (−40°F).

Long-term low maintenance

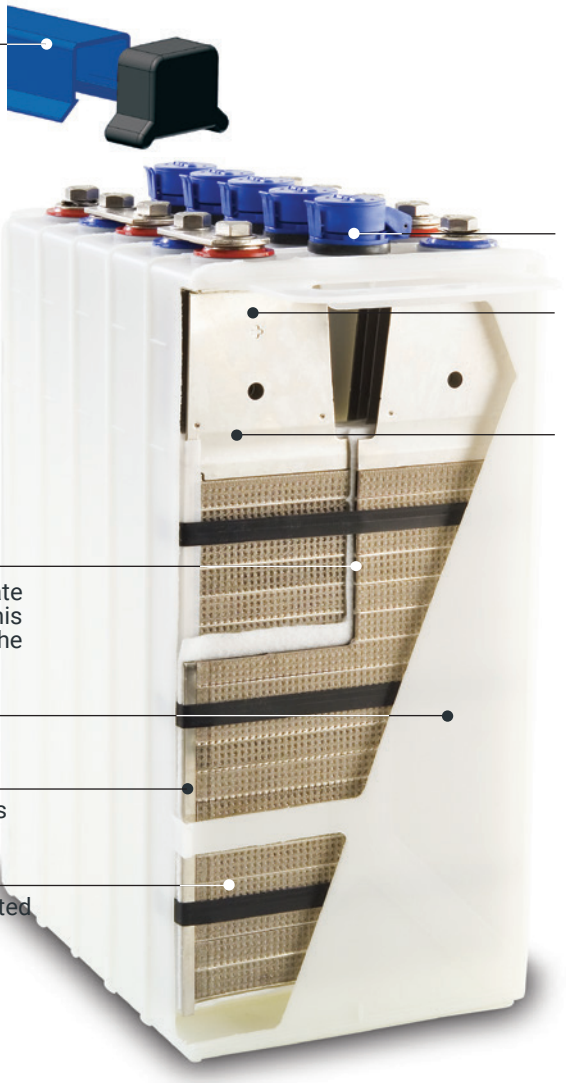
The low life-cycle cost Alcad Solar range battery is a reliable long-term investment. It is constructed to resist electrical and physical abuses and therefore requires very low maintenance. In return it will provide totally reliable service at a predictable cost over 20 years.

Additionally, Alcad Solar's reliability reduces demands on expensive diesel generators, thereby contributing to the overall system running cost reduction.

Low life-cycle cost

Long maintenance intervals, Ni-Cd's inherent safety and total reliability combine to make Alcad Solar an exceptionally low life-cycle cost solution.

Solar



Ni-Cd endures...

Alcad Solar batteries are built around Alcad's proven Ni-Cd pocket plate technology.

Active materials and nickel-plated steel components plus gas recombination technology give maintenance intervals of more than 6 years, reducing operating costs to a minimum.

...where lead acid cannot

Nickel-cadmium technology is inherently safe and resistant to over-, under- and complete discharging. Even at temperatures below –20°C (–4°F), Alcad Solar continues to perform without risk of corrosion or sulphation when cycled at low state of charge.

Alkaline electrolyte will not freeze and remains stable during operation. Lead acid batteries suffer from plate degradation, shortened life and risk of sudden death in similar conditions.

Alcad Solar Ni-Cd continues operating in conditions where lead acid cannot.

Alcad recycles

Alcad recycle old batteries as part of their responsibility to safeguard the environment.

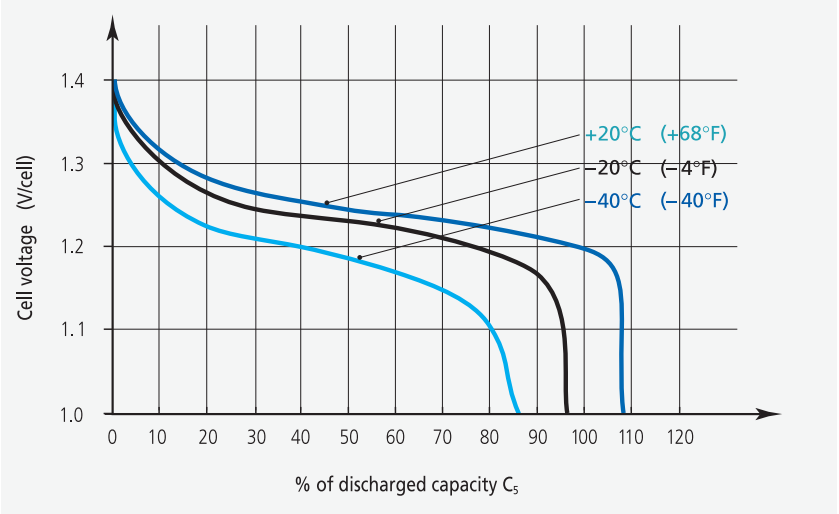
Automated water filling system

Alcad's water filling system is available as an option for Solar cell range. It enables automatic, fast and accurate topping-up, further extending maintenance intervals.

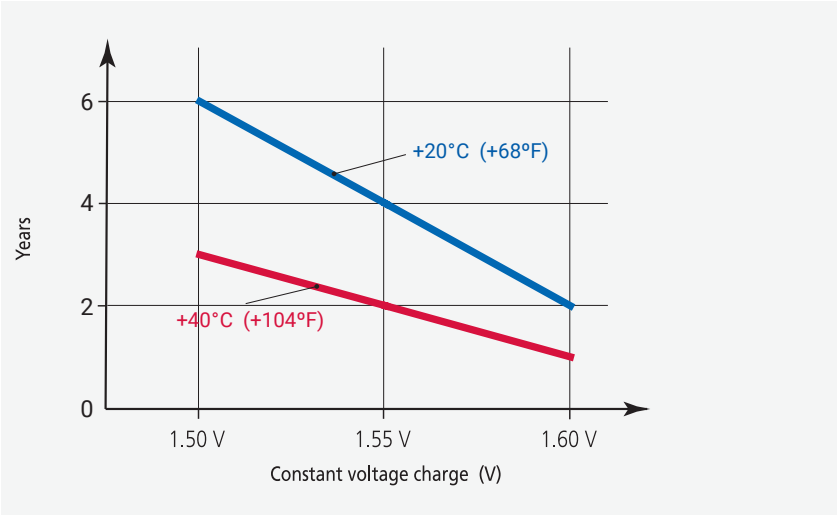
Meeting international standards

Alcad Solar has been developed in line with the safety requirements of EN 50272-2 / IEC 62485-2, and components used (such as insulated cable connectors and end lug covers) are defined to ensure high protection against electric shocks (IP2 level).

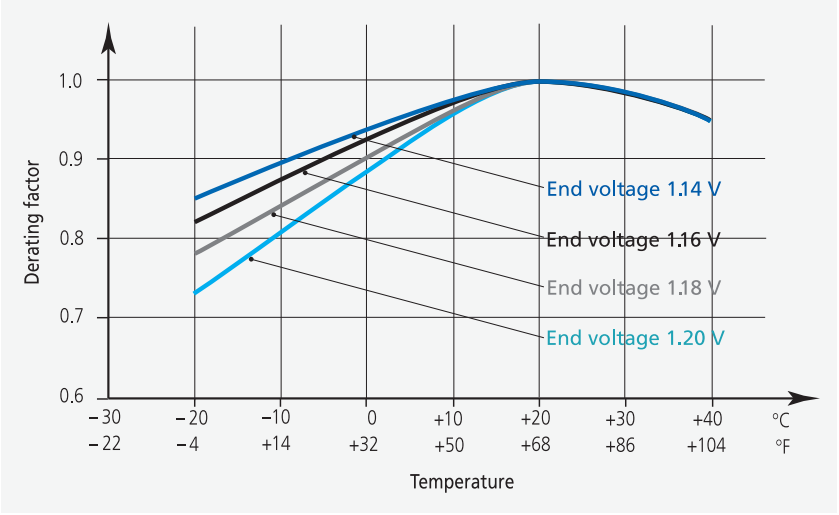
Alcad Solar features Alcad's highly efficient internal gas recombination pocket plate technology – meets IEC 62259 – and electrode design optimised for photovoltaic applications.



Discharge curves at 1/120 C_{120} A according to temperature.
Battery fully charged.



Typical water replenishment at +20°C (+68°F) and +40°C (+104°F).



Derating factor according to temperature and end voltage.
For typical solar application with 3 or more days back-up time.

Battery sizing

Alcad engineers will work with you to calculate the optimum size of battery for your application. They will consider location, operating temperature, anticipated discharge requirements and your system's charging capabilities.

The battery size or Ampere-hours (Ah) required will depend on average load and minimum back-up time or autonomy. Capacity should be sufficient to sustain days of discharge with minimum support from the renewable energy source.

With daily limited time for charging, batteries are not always able to reach full charge. By operating the system so that it approaches, but rarely reaches full capacity, water consumption and maintenance are reduced considerably. By adhering to the recommended charging voltage provided in Table 1, the battery should reach 95% state of charge under average operating conditions.

Initial calculations

Most installations are 12, 24 or 48-volt systems. Typically for these system voltages 9, 18 and 36 cells are used. However, depending on various conditions these numbers may be adjusted by one or two cells.
First, determine the number of cells by establishing:

- Maximum permitted charging voltage
- Daily depth of discharge
- Minimum permitted end voltage

Second, check if "ideal" operating conditions can be established, by consulting Table 1.

Third, check in the cell performance tables the cell type giving the selected current in relation to the end voltage and the back-up time.

Additional sizing considerations

Operating temperature will influence available capacity. While Ni-Cd batteries are less affected by temperature variations than lead acid, it may still be advisable to include derating factors in sizing calculations according to the temperature and end voltage. Refer to derating factor curves on page 4.

Other factors such as design margin, battery aging and future load extension may be included for the battery sizing.

Alcad's optimum sizing method is:
I load
x 1/temperature derating factor
x 1/charge derating factor*
x requested design margin
= current value to select in the performance table

*The typical value is 95% when using the recommended charge voltage

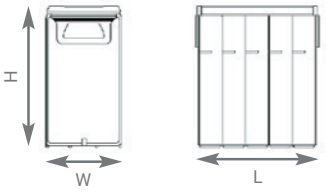
Table 1. Recommended charging voltage

Battery system	12 V	24 V	48 V
Number of cells	9	18	36
5-10% daily depth of discharge	13.5 V	27 V	54 V
10-15% daily depth of discharge	13.95 V	27.9 V	55.8 V
15-25% daily depth of discharge	14.4 V	28.8 V	57.6 V

The range for a world of stand-alone systems

M Type	Capacity		Height		Width		Lenght per block												Approx. Weight per cell		Internal Resistance	Cell connection bolt per pole
							1 cell		2 cells		3 cells		4 cells		5 cells		6 cells					
	C120 Ah	C5 Ah	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	kg	lb	mOhm	
PV 50	50	45	411	16,2	195	7,7			63	2 5	88	3 5	113	4 4	138	5 4	163	6 4	3,2	7,1	5 38	M6
PV 100	100	95	411	16 2	195	7,7			85	3 3	121	4 8	157	6 2	193	7 6	229	9 0	4 9	10 8	2.55	M8
PV 136	136	126	411	16 2	195	7,7			109	4 3	157	6 2	205	8 1	253	10 0	301	11 9	6 6	14,6	1,92	M10
PV 150	150	140	411	16,2	195	7,7			109	4,3	157	6,2	205	8,1	253	10,0	301	11,9	6,7	14,8	1,73	M10
PV 175	175	163	411	16 2	195	7,7			133	5 2	193	7 6	253	10 0	313	12 3	373	14 7	8 3	18 3	1 48	M10
PV 200	200	185	411	16 2	195	7,7			133	5 2	193	7 6	253	10 0	313	12 3	373	14 7	8 4	18 5	1 31	M10
PV 235	235	218	411	16,2	195	7,7			159	6,3	232	9,1	305	12,0	378	14,9	451	17,8	9,8	21,6	1,11	M10
PV 250	250	235	411	16 2	195	7 7			159	6 3	232	9 1	305	12 0	378	14 9	451	17 8	9 9	21 8	1 03	M10
PV 275	275	253	411	16 2	195	7,7			183	7 2	268	10 6	353	13 9	438	17 2	523	20 6	11 4	25 1	0 96	M10
PV 305	305	280	411	16,2	195	7,7			183	7,2	268	10,6	353	13,9	438	17,2	523	20,6	11,5	25,4	0,86	M10
PV 320	320	294	411	16 2	195	7,7	121	4 8	229	9 0	337	13 3							15 0	33 1	0 82	2xM10
PV 355	355	325	411	16 2	195	7,7	121	4 8	229	9 0	337	13 3							15 1	33,3	0,74	2xM10
PV 370	370	338	411	16,2	195	7,7	133	5,2	253	10,0	373	14,7							16,7	36,8	0,72	2xM10
PV 405	405	375	411	16 2	195	7,7	133	5 2	253	10 0	373	14 7							16 8	37 0	0 65	2xM10
PV 415	415	380	411	16 2	195	7,7	146	5 7	279	11 0	412	16 2							18 1	39 9	0 64	2xM10
PV 455	455	420	411	16,2	195	7,7	146	5 7	279	11 0	412	16 2							18 3	40 3	0 58	2xM10
PV 485	485	450	411	16 2	195	7,7	159	6 3	305	12 0	451	17 8							19 6	43 2	0 54	2xM10
PV 505	505	470	411	16 2	195	7,7	159	6 3	305	12 0	451	17 8							19 8	43,7	0,51	2xM10
PV 555	555	515	411	16,2	195	7,7	171	6,7											21,4	47,2	0,47	2xM10
PV 596	596	547	411	16 2	195	7,7	207	8 1											25 8	56 9	0 44	3xM10
PV 610	610	560	411	16,2	195	7,7	183	7 2											23 0	50 7	0 43	2xM10
PV 645	645	595	411	16,2	195	7.7	207	8.1											26,3	58,0	0.41	3xM10
PV 660	660	610	411	16 2	195	7,7	207	8 1											26 5	58 4	0 40	3xM10
PV 710	710	650	411	16 2	195	7,7	219	8 6											28 2	62 2	0 37	3xM10
PV 760	760	700	411	16,2	195	7,7	232	9,1											29,7	65,5	0,35	3xM10
PV 790	790	729	411	16 2	195	7,7	244	9 6											30 6	67 5	0 33	3xM10
PV 810	810	750	411	16 2	195	7,7	243	9 6											31 4	69,2	0,32	3xM10
PV 835	835	774	411	16,2	195	7,7	256	10,1											32,1	70.8	0,31	3xM10
PV 860	860	800	411	16 2	195	7,7	256	10 1											32 9	72 5	0 30	3xM10
PV 910	910	840	411	16 2	195	7,7	268	10 6											34 5	76 1	0 29	3xM10
PV 930	930	862	411	16,2	195	7,7	292	11,5											37 6	82 9	0 28	4xM10
PV 960	960	890	411	16 2	195	7,7	292	11 5											38 1	84 0	0 27	4xM10
PV 1015	1015	940	411	16 2	195	7,7	305	12 0											39 6	87 3	0 26	4xM10
PV 1065	1065	980	411	16,2	195	7,7	316	12,4											41.2	90,8	0,25	4xM10
PV 1115	1115	1030	411	16 2	195	7,7	328	12 9											42 9	94 6	0 23	4xM10
PV 1170	1170	1080	411	16,2	195	7.7	353	13 9											46 3	102 1	0 22	4xM10
PV 1215	1215	1120	411	16,2	195	7,7	353	13,9											46,0	101,4	0,22	4xM10
PV 1245	1245	1150	411	16 2	195	7,7	378	14 9											49 0	108 0	0 21	5xM10
PV 1270	1270	1170	411	16 2	195	7,7	378	14 9											49 5	109 1	0 21	5xM10
PV 1320	1320	1220	411	16,2	195	7,7	388	15,3											51,3	113,1	0,20	5xM10
PV 1370	1370	1260	411	16 2	195	7,7	401	15 8											52 7	116 2	0 19	5xM10
PV 1385	1385	1279	411	16,2	195	7,7	401	15,8											54,0	119,0	0,19	5xM10
PV 1420	1420	1300	411	16,2	195	7,7	413	16 3											54 4	119 9	0 19	5xM10
PV 1470	1470	1350	411	16 2	195	7,7	426	16 8											55 9	123 2	0 18	5xM10
PV 1520	1520	1400	411	16 2	195	7,7	438	17 2											57 5	126 8	0 17	5xM10
PV 1570	1570	1450	411	16,2	195	7,7	463	18,2											61,0	134,5	0 17	6xM10
PV 1620	1620	1500	411	16 2	195	7,7	473	18 6											62 8	138 4	0 16	6xM10
PV 1670	1670	1550	411	16 2	195	7,7	486	19 1											64 2	141 5	0 16	6xM10
PV 1720	1720	1600	411	16,2	195	7,7	498	19,6											65,9	145,3	0,15	6xM10
PV 1775	1775	1650	411	16 2	195	7,7	511	20 1											67 4	148 6	0 15	6xM10
PV 1830	1830	1700	411	16,2	195	7,7	523	20 6											69 0	152 1	0 14	6xM10

* Rigid connector included
PV 100 to PV 505: standard mounted on racks
PV 555 to PV 1830: crosswise mounted on racks.



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Reliability inside

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