

BAE *SECURA solar*

Batteries for photovoltaic systems



 **AWS**

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ENERGY FROM BATTERIES



BAE *SECURA solar*

The reliable energy storage batteries.

Guaranteed energy supply, when the sun is not shining.

The sun is our largest energy supplier. Per year reach us 10^{12} GWh from it. This corresponds to the 10^4 fold of the world wide primary energy consumption. A huge potential, which can be used more and more with photovoltaic technology.

Already today an efficiency of 15 % (electrical power/ solar power) is reality. And in the near future by further development of the photovoltaic modules up to more than 30 % is possible. Already today solar power, buffered by batteries, is daily used in various applications.



leisure time sector

- isolated weekend houses
- camping cars and caravans
- sailing boats
- huts in high mountains

remote power plants

- photovoltaic power generation plants, also in combination with wind generators

telecommunication

- radio relay stations
- cellular phone stations
- TV converter
- optical fibre intermediate repeater

safety technology

- signal buoys
- roadwork lights
- protection against corrosion and control of buildings and pipelines

traffic technology

- traffic regulating systems
- alternating traffic signs
- traffic jam – warning device
- traffic lights
- emergency call stations
- level crossings
- car – park ticket computers

measurement technology

- measurement stations for air pollution, meteorology, seismography and water level

information and advertisement

- illuminated posters
- turn around displays
- prism reverser

BAE *SECURA solar*

Product range:

Which battery for which operation?

Experts in solar technology, ISE – Freiburg, ZSW – Ulm, ISET – Kassel and WIP – München have classified the battery applications according to their stress profile into 4 groups:

	class 1	class 2	class 3	class 4
typical applications	measurement station traffic technology	small solar house	farmstead mountain hut	village power supply
solar fraction	100 %	70–90 %	approx. 50 %	30–50 %
storage capacity is for	> 10 days	3–5 days	1–3 days	approx. 1 day
current	low	low	middle	high
number of cycles	small	middle	middle	high
requested safety against deep discharge	high	high	middle	middle
request for low self discharge	high	high	middle	middle
BAE recommendation				
	<i>PVM solar</i> <i>PVB solar</i>	<i>PVM solar</i> <i>PVS solar</i> <i>PVV solar</i>	<i>PVV solar</i>	<i>PVS solar</i> <i>PVV solar</i>

BAE *SECURA PVM solar*

Vented lead-acid
battery cells
2 V, C100
224 Ah – 1118 Ah

BAE *SECURA PVS solar*

Vented lead-acid monobloc
batteries and cells
2 V, 6 V and 12 V, C100
72 Ah – 4664 Ah

BAE *SECURA PVV solar*

Valve-regulated lead-acid
monobloc batteries and cells
2 V, 6 V and 12 V, C100
74 Ah – 4185 Ah

BAE *SECURA PVB solar*

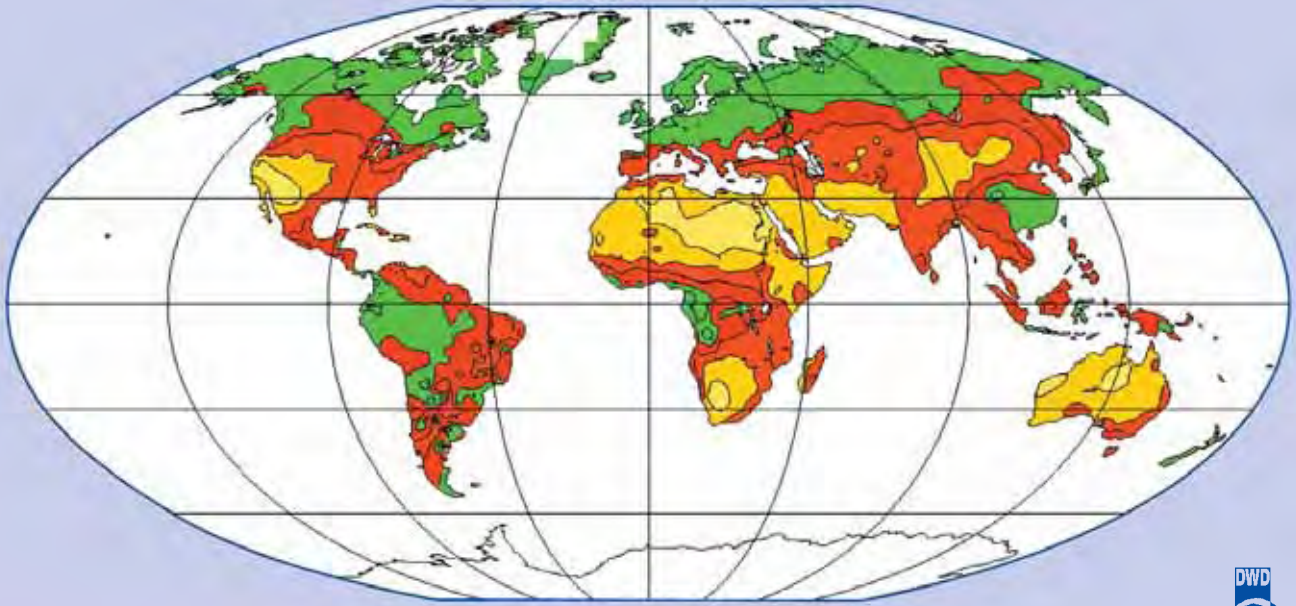
Valve-regulated lead-acid
monobloc batteries
6 V and 12 V, C100
54 Ah – 225 Ah

- low maintenance
- proven technology
- high operational safety
- low water consumption
- on request available with forced electrolyte circulation

- maintenance-free
- high power
- very good cycle life
- safe against deep discharge
- low self discharge



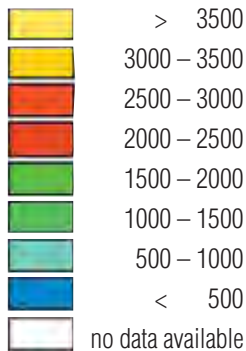
From solar power to electric current – safely stored in BAE *SECURA solar* Batteries.



flächentreue Netzprojektion nach Mollweide

© Deutscher Wetterdienst

Yearly average of sunshine hours:



This map shows the potential of solar energy in different regions of our planet.

By new technologies of conversion of solar power to electric current and the mature battery technology

of BAE we can switch on “solar light” everywhere in the world.

Technical Specification BAE *SECURA PVM solar*

3. DESIGN AND OPERATIONAL DATA

- robust tubular plate as a positive plate (PbSb1.6SnSe - alloy)
- grid-plate in low antimony alloy
- tank formed plates
- sulphuric acid with a density of 1.24 kg/l
- 100 % acid tight pole bushing
- female poles with brass inlay M10 for flexible fully insulated intercell and terminal connectors
- battery container and lid made of polypropylene
- touch-proof according to VBG4, IP25 acc. to DIN EN 60529
- operating temperature -20 °C to +55 °C (recommended +10 °C to +30 °C)
- self discharge approximately 3 % per month at 20 °C

4. INSTALLATION

PVM solar battery cells have to be installed either in steel, wooden, or plastic battery trays.

5. MAINTENANCE

- check battery and single cell voltage as well as temperature every 6 months
- check of mechanical and electrical connections, record battery and single cell voltage as well as temperature every 12 months average water-refilling interval every 6 months (depending on utilization and ambient temperature)

6. NUMBER OF CYCLES AS FUNCTION OF DOD (DEPTH OF DISCHARGE)

Depth of discharge [DOD]	80 %	70 %	60 %	50 %	40 %	30 %	20 %	10 %
Cycles	1500	1800	2200	2800	3750	5200	8100	18000

7. CAPACITY AS FUNCTION OF TEMPERATURE

Temperature	20 °C	15 °C	10 °C	5 °C	0°C	-5°C	-10°C	-20°C
C 100	100 %	98 %	94 %	90 %	85%	79%	72%	55%

8. OPERATION

The discharge of the battery cells has to be restricted to 80 % DOD. At lower voltages as U80% the battery cells has to be disconnected from the grid in order to avoid any damage.

Within one week up to 4 weeks the battery cells have to be charged to 100 %.

The charging current may vary from 5 x I 10 to 0.01 x I 10. The charging voltage has to be restricted to 2.30 V to 2.40 V.

At daily discharge below 0.2 C 10 → 2.30 V - 2.35 V

At daily discharge above 0.2 C 10 up to 0.3 C 10 → 2.35 V - 2.40 V

At daily discharges of more than 0.3 C 10 a damaging acid stratification occurs, if not weekly a gassing charge is performed or a forced electrolyte circulation is used.

BAE *SECURA PVM solar* battery cells are already prepared for forced electrolyte circulation. Necessary accessories have to be enquired separately.

9. STANDARDS

Test standard	IEC 60896-11, IEC 61427
Safety standard, ventilation	EN 50272-2



Technical Specification Valve-Regulated Lead-Acid Batteries (VRLA)



1. APPLICATION

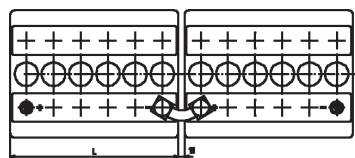
Photovoltaic power supply of

- telecommunication equipment as micro-wave amplifier, cellular phone stations, television relay installations etc,
- traffic equipment like traffic regulating systems, signal buoys, road lights
- remote weekend houses, farmsteads, huts in high mountains etc.

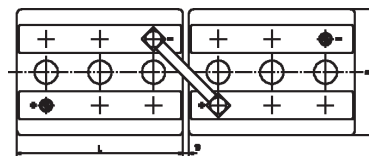
Solar and wind powered stations. In these cases the battery serves to buffer load peaks, to smooth the current and to reduce the operation time of Diesel engines at low power demand.

2. TECHNICAL DATA (REFERENCE TEMPERATURE 20 °C)

Type	C 100 Ah	C 72 Ah	C 20 Ah	C 10 Ah	C 1 Ah	Ri mΩ	Ik kA	Weight kg	Dimensions mm L x W x H
Ue 80 %	1.91 V	1.91 V	1.91 V	1.90 V	1.82 V				
Ue 100 %	1.80 V	1.80 V	1.80 V	1.80 V	1.67 V				
12 V 1 PVV 70	74	72	65	59	34	21.6	0.58	42.5	272 x 205 x 385
12 V 2 PVV 140	127	125	117	107	69	10.8	1.15	50.5	272 x 205 x 385
12 V 3 PVV 210	201	197	185	169	101	7.20	1.73	72	380 x 205 x 385
6 V 4 PVV 280	260	255	240	219	129	2.70	2.30	48	272 x 205 x 385
6 V 5 PVV 350	327	322	302	276	165	2.16	2.88	63	380 x 205 x 385
6 V 6 PVV 420	387	280	357	326	200	1.80	3.45	70	380 x 205 x 385



12V 1 PVV 70 to 12V 3 PVV 210



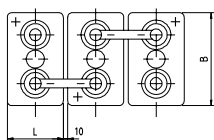
6V 4 PVV 280 to 6V 6 PVV 420

Terminals are designed as female poles with brass inlay M10 for solid or flexible fully insulated intercell and terminal connectors.

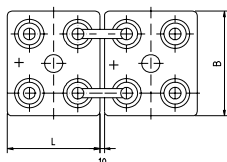
Technical Specification BAE *SECURA PVV solar*

Type	C 100 Ah	C 72 Ah	C 20 Ah	C 10 Ah	C 1 Ah	Ri mW	Ik kA	Weight kg	Dimensions mm L x W x H
Ue 80 %	1 91 V	1 91 V	1 91 V	1 90 V	1 80 V				
Ue 100 %	1 80 V	1 80 V	1 80 V	1 80 V	1 67 V				

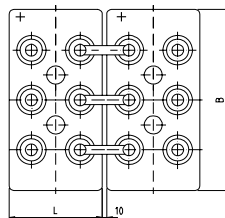
4 PVV 280	298	292	269	231	132	1,20	1,70	19,5	105 x 208 x 420
5 PVV 350	373	366	336	289	170	0,96	2,15	23,5	126 x 208 x 420
6 PVV 420	447	438	404	346	204	0,80	2,57	28	147 x 208 x 420
5 PVV 550	536	525	481	415	227	0,71	2,88	31	126 x 208 x 535
6 PVV 660	642	629	576	497	272	0,60	3,46	36,5	147 x 208 x 535
7 PVV 770	749	734	673	580	318	0,51	4,04	42	168 x 208 x 535
6 PVV 900	914	895	821	708	390	0,45	4,58	50	147 x 208 x 710
8 PVV 1200	1219	1194	1095	944	520	0,34	6,10	68	215 x 193 x 710
10 PVV 1500	1524	1492	1369	1180	650	0,27	7,63	82	215 x 235 x 710
12 PVV 1800	1834	1796	1647	1420	780	0,23	9,15	97	215 x 277 x 710
12 PVV 2280	2092	2048	1879	1620	870	0,24	8,58	120	215 x 277 x 855
16 PVV 3040	2790	2731	2506	2160	1159	0,18	11,4	160	215 x 400 x 815
20 PVV 3800	3487	3414	3132	2700	1449	0,14	14,3	200	215 x 490 x 815
24 PVV 4560	4185	4097	3758	3240	1739	0,12	17,1	240	215 x 580 x 815



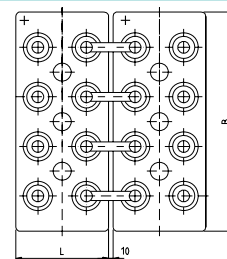
4 PVV 280 to 6 PVV 900



8 PVV 1200 to 12 PVV 2280



16 PVV 3040



20 PVV 3800 to 24 PVV 4560

Terminals are designed as female poles with brass inlay M10 for solid or flexible fully insulated intercell and terminal connectors.

3. NUMBER OF CYCLES AS FUNCTION OF DOD (DEPTH OF DISCHARGE)

Depth of discharge [DOD]	80 %	70 %	60 %	50 %	40 %	30 %	20 %	10 %
Cycles	1500	1800	2200	2800	3750	5200	8100	18000

4. CAPACITIY AS FUNCTION OF TEMPERATURE

Temperature	20 °C	15 °C	10 °C	5 °C	0 °C	-5 °C	-10 °C	-20 °C
C100	100 %	97 %	93 %	89 %	85 %	80 %	74 %	62 %

5. OPERATION

At lower voltages as U80% the battery has to be disconnected to avoid a damage of the battery.

Within one week up to 4 weeks the battery cells have to be charged to 100 %.

The charging current may vary from $5 \times I_{10}$ to $0.01 \times I_{10}$. The charging voltage has to be restricted to 2.30 V to 2.40 V.

At daily discharge below 0.4 C 10 → 2.30 V - 2.35 V

At daily discharge up to 0.6 C 10 → 2.35 V - 2.40 V

If the monthly average temperatures are below 10 °C, the charging voltage has to be increased by 0.03 V per 10 °C.

6. STANDARDS

Test standard

IEC 60896-21, IEC 61427

Safety standard, ventilation

EN 50272-2



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