

## Technical Information about operating batteries in high temperature environmental

For the battery life the temperature is an important parameter. Increasing temperatures means decreasing life time. In this case the average temperature is the main key value and not the peak temperature. Generally an average day temperature about 40°C (104°F) is untypical. For sure 40°C – 50°C in peaks is realistic, but in the daily average it might be lower. The average day temperatures in deserts are probably at 25°C to 30°C. Even the hottest places on earth just recorded with a daily average temperature of 40°C.

Within the graph you can find an aging factor. This aging factor is based on the Arrhenius law, which is always used to describe the influence of temperature to chemical reactions. You can find also the thumbs rule of having only a half lifetime when increasing the temperature by 10 Kelvin.

Example:

20°C to 40°C

Aging factor: 5,34

Service life at 20°C: 20 years

(Calculated) expected service life: 20 years /5,34 = 3,74 years

Here are some more accurate factors (than you can read within the diagram) for some specific temperatures: (all values based on a nominal reference temperature of 20°C)

25°C: 1,55

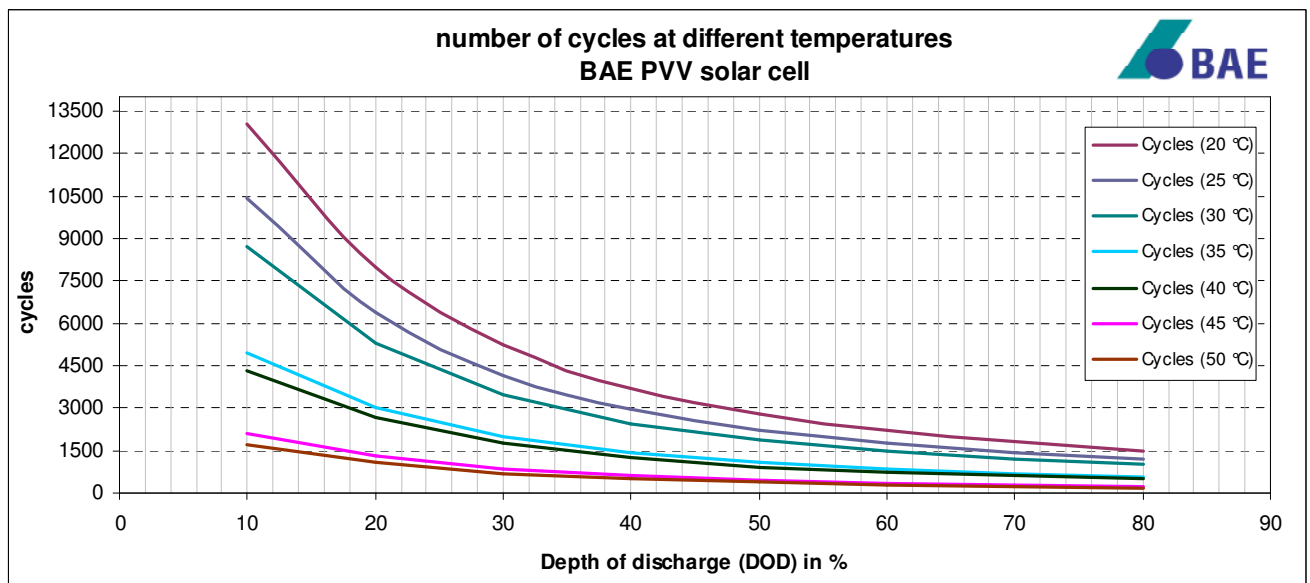
30°C: 2,38

35°C: 3,59

40°C: 5,34

45°C: 7,86

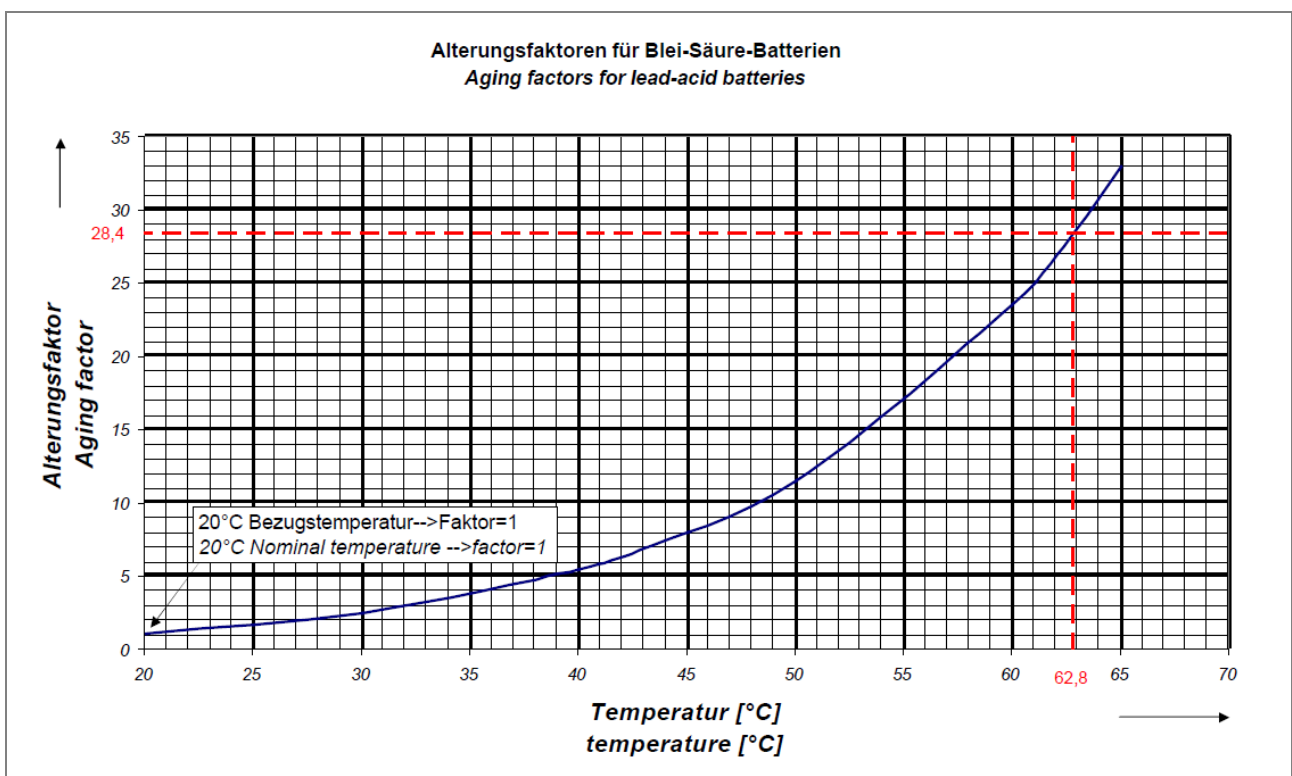
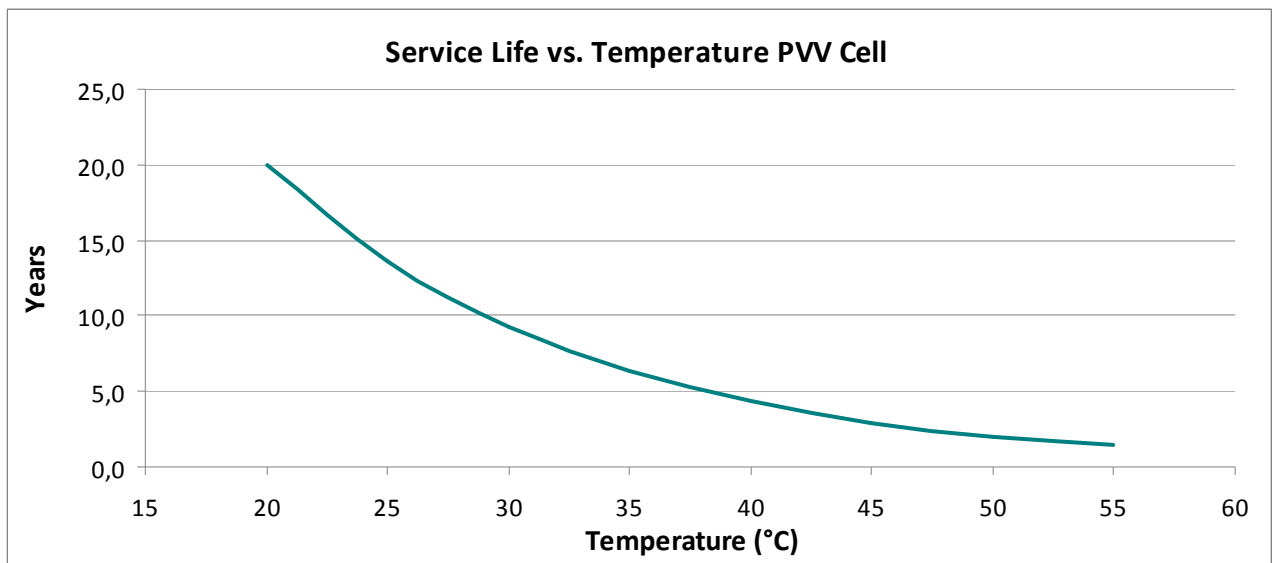
You can find tables of Cycle-Life vs. Temperature ratio and the Service-Life vs. Temperature ratio below:



## Technical Information BAE

These values are calculated. They don't describe absolute values. It can not be excluded that there are minimal deviation in cycle life.

DOD	Cycles (20 °C)	Cycles (25 °C)	Cycles (30 °C)	Cycles (35 °C)	Cycles (40 °C)	Cycles (45 °C)	Cycles (50 °C)
10	13045	10436	8697	4970	4348	2130	1726
20	7981	6385	5321	3040	2660	1303	1056
30	5225	4180	3483	1990	1742	853	691
40	3710	2968	2473	1413	1237	606	491
50	2797	2238	1865	1066	932	457	370
60	2204	1763	1469	840	735	360	292
70	1797	1438	1198	685	599	293	238
80	1503	1202	1002	573	501	245	199



## Technical Information **BAE**

### Protocol and discharge curve for Load Profile (just 10 hour discharge)

#### **Load Profile:**

2700W

10 hours daily

48V DC to 220VAC

Back-up time to be 2 days (20 hours)

Working temperature up to 40 degr. C in summer time

#### **Battery type:**

**PVV cell (solar)**

Operating temperature:

40.0 °C

Number of parallel strings:

1

Number of cells per string:

24

#### **Electrical data:**

Min. cell voltage:

1.8 V

#### **Load profile:**

0.

10h 3,000 W

#### **Battery type:**

**12 PVV 2280**

Utilization:

30.76 %

Remaining time till 100% DOD:

22.525 h

Remaining energy till 100% DOD:

67,575.767 Wh

Min. cell voltage:

2.026 V

Min. string voltage:

48.547 V

Final voltage per cell:

2.026 V

Final voltage of battery:

48.547 V

Average voltage:

49.116 V

Air ventilation acc. to EN 50272-2

Stand-by mode:

Air volume flow:

1.8 m<sup>3</sup>/h

Inlet and outlet cross section:

50.4 cm<sup>2</sup>

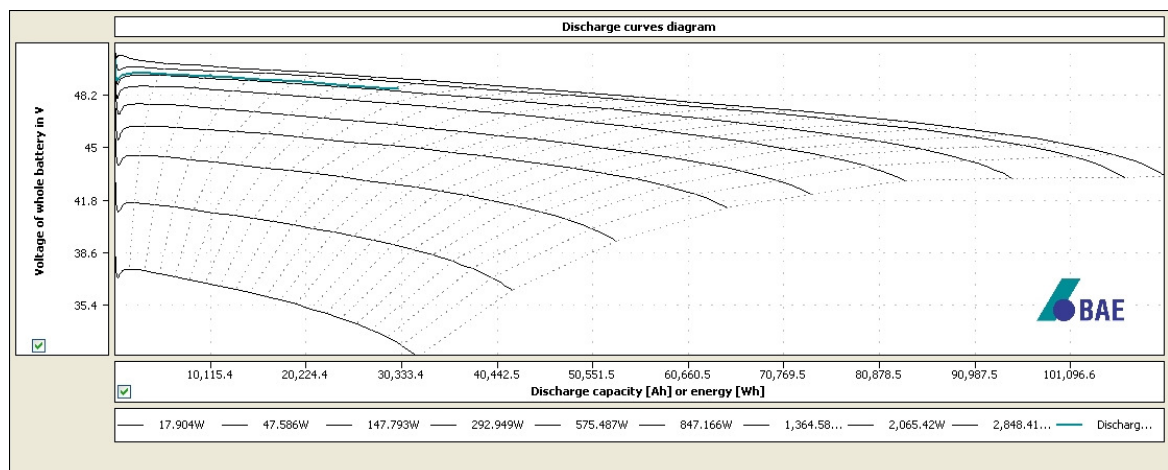
Buffer mode (2,4 V/cell):

Air volume flow:

14.4 m<sup>3</sup>/h

Inlet and outlet cross section:

403.2 cm<sup>2</sup>



## Technical Information **BAE**

### Protocol and discharge curve for Load Profile with 2 Back-up times

#### Load profile:

2700W

10 hours daily

48V DC to 220VAC

Back-up time to be 2 days (20 hours)

Working temperature up to 40 degr. C in summer time

#### Battery type:

**PVV cell (solar)**

Operating temperature:  
Number of parallel strings:  
Number of cells per string:  
Electrical data: Sizing after:  
Data for cells or blocks  
Min. cell voltage:

40.0 °C  
1  
24  
  
1.8 V

#### Load profile:

0.	10 h 3,000 W
1.	10 h 3,000 W
2.	10 h 3,000 W

#### Battery type:

**12 PVV 2280**

Utilization:	92.28 %
Remaining time till 100% DOD:	2.51 h
Remaining energy till 100% DOD:	7,531.828 Wh
Min. cell voltage:	1.863 V
Min. string voltage:	44.631 V
Final voltage per cell:	1.863 V
Final voltage of battery:	44.631 V
Average voltage:	47.646 V

Air ventilation acc. to EN 50272-2

Stand-by mode:

Air volume flow: 1.8 m<sup>3</sup>/h

Inlet and outlet cross section: 50.4 cm<sup>2</sup>

Buffer mode (2,4 V/cell):

Air volume flow: 14.4 m<sup>3</sup>/h

Inlet and outlet cross section: 403.2 cm<sup>2</sup>

