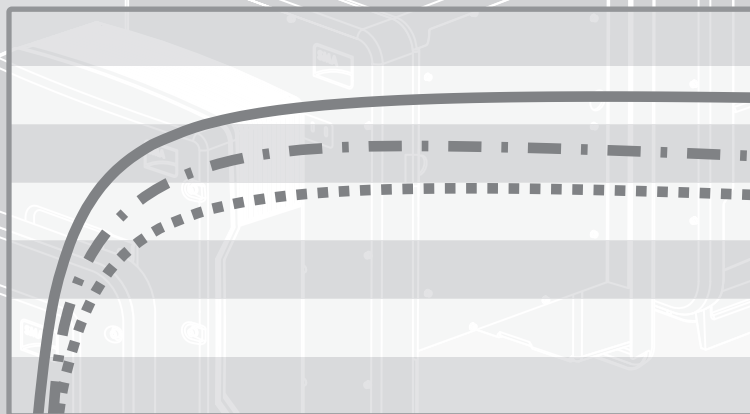


Technical Information

## Efficiency and Derating

SUNNY BOY / SUNNY TRIPOWER / SUNNY HIGHPOWER



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# 1 Information on this Document

## 1.1 Validity

This document describes in graphic and tabular form the efficiency profile and the derating behavior in accordance with DIN EN 50524:2010 of the following SMA inverters (status: 01/2020, subject to technical changes):

### **Sunny Boy**

- SB5.5-LV-JP-41

### **Sunny Tripower**

- STP 50-JP-40
- STP 60-JP-10
- STP 10000TLEE-JP-10 / STP 10000TLEE-JP-11 / STP 20000TLEE-JP-11
- STP 24500TL-JP-30 / STP 25000TL-JP-30

### **Sunny Highpower**

- SHP 75-JP-10
- SHP 100-JP-20 / SHP 143-JP-20

## 1.2 Target Group

The information in this document is intended for installers and operators of PV systems with SMA inverters as well as for PV system planners.

## 2 Data Explanation

### Efficiency Profile - Curve and Measured Values

The efficiency is the ratio of output power to input power and is given as a percentage value. This document shows the inverter efficiency in a graphic and as a table. The efficiency is given for the minimum MPP voltage, the rated input voltage and the maximum MPP voltage.

### Maximum efficiency / efficiency as per JIS C 8961

The maximum efficiency is the highest inverter efficiency at rated input voltage. The efficiency as per JIS C 8961 corresponds to the efficiency determined by the method described in the standard at rated input voltage and rated power.

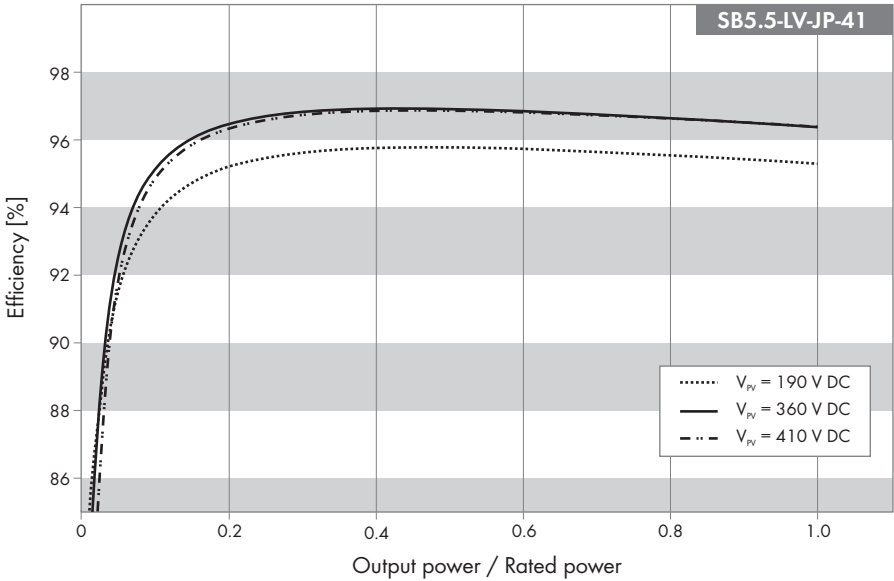
### Derating Behavior

Safety mechanisms are implemented in the inverter protecting the inverter against damage due to too high ambient temperatures or too high output currents. This behavior reduces the inverter output power (derating). In this document, the derating behavior of the inverters is shown in graphic form. The derating behavior is given for the minimum MPP voltage, the rated input voltage and the maximum MPP voltage.

### 3 Sunny Boy

#### 3.1 SB5.5-LV-JP-41

##### 3.1.1 Efficiency



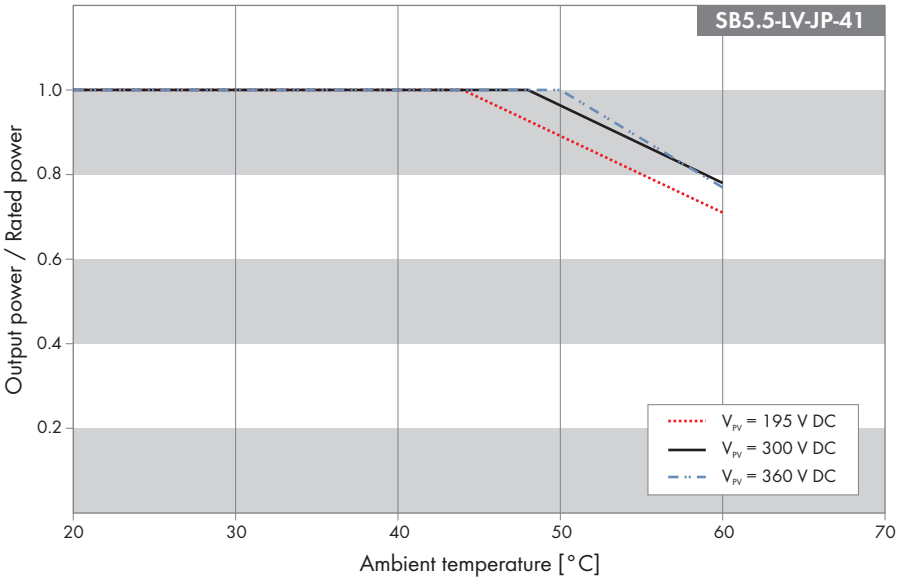
Maximum efficiency, $\eta_{max}$	96.9 %
Efficiency as per JIS C 8961, $\eta_{JIS}$	96.0 %

##### Efficiency Profile

Standardized output power	Efficiency		
	Minimum MPP voltage 190 V	Rated input voltage 368 V	Maximum MPP voltage 410 V
5 %	91.4 %	92.5 %	91.7 %
10 %	93.8 %	95.1 %	94.8 %
20 %	95.2 %	96.4 %	96.3 %
25 %	95.5 %	96.7 %	96.6 %
30 %	95.6 %	96.8 %	96.7 %
50 %	95.8 %	96.9 %	96.9 %

Standardized output power	Efficiency		
	Minimum MPP voltage 190 V	Rated input voltage 368 V	Maximum MPP voltage 410 V
75 %	95.6 %	96.7 %	96.7 %
100 %	95.3 %	96.4 %	96.4 %

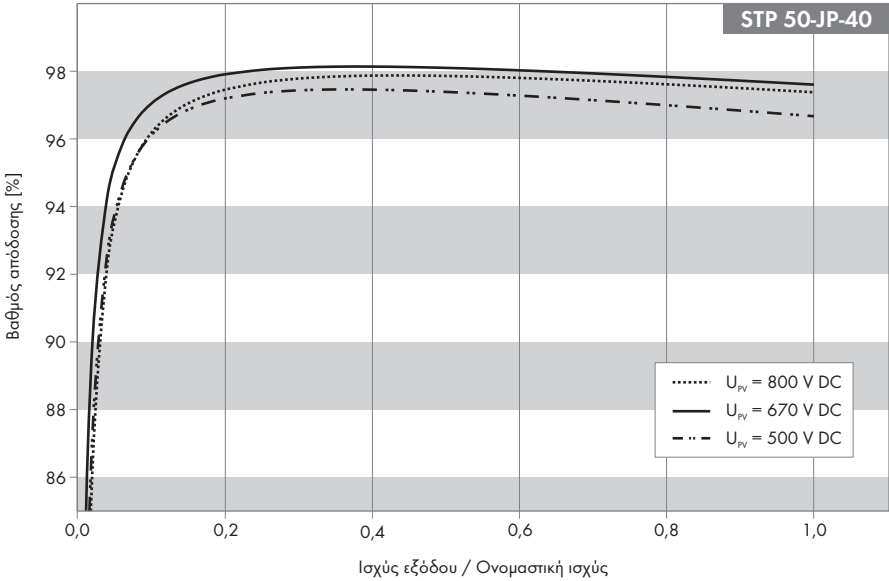
### 3.1.2 Derating Behavior



## 4 Sunny Tripower

### 4.1 STP 50-JP-40

#### 4.1.1 Efficiency



Maximum efficiency,  $\eta_{max}$  98.1 %

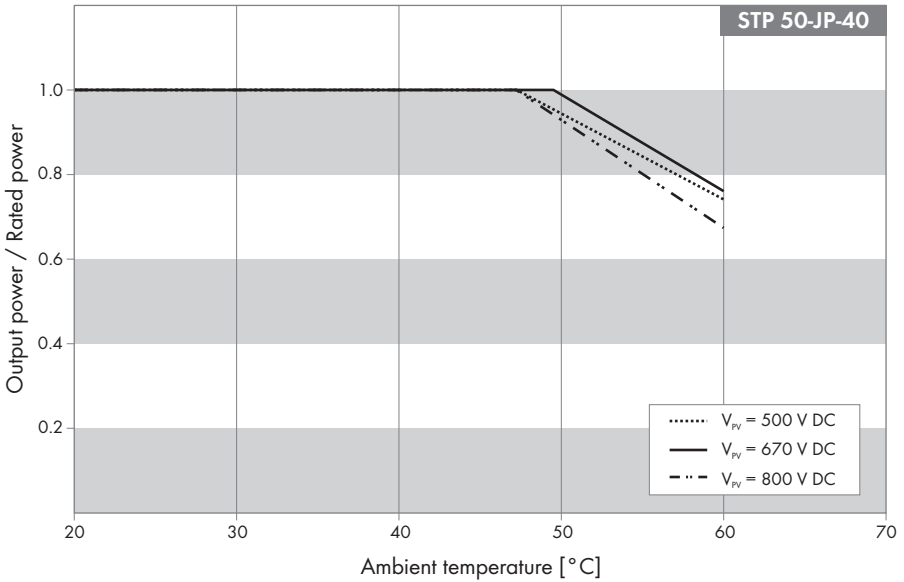
Efficiency as per JIS C 8961,  $\eta_{JIS}$  97.5 %

#### Efficiency Profile

Standardized output power	Efficiency		
	Minimum MPP voltage 500 V	Rated input voltage 670 V	Maximum MPP voltage 800 V
5 %	93.7 %	95.2 %	93.5 %
10 %	96.1 %	97.0 %	96.2 %
20 %	97.2 %	97.9 %	97.4 %
25 %	97.3 %	98.0 %	97.6 %
30 %	97.4 %	98.1 %	97.8 %
50 %	97.4 %	98.1 %	97.8 %

Standardized output power	Efficiency		
	Minimum MPP voltage 500 V	Rated input voltage 670 V	Maximum MPP voltage 800 V
75 %	97.1 %	97.9 %	97.6 %
100 %	96.7 %	97.6 %	97.4 %

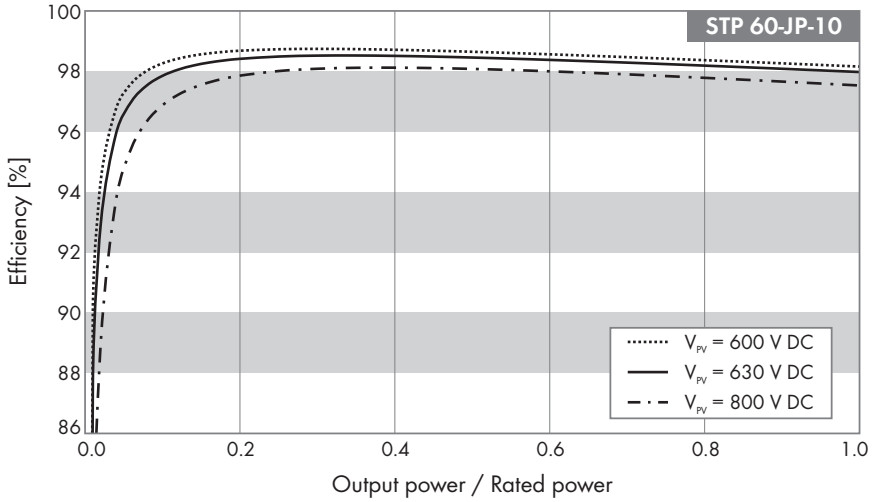
### 4.1.2 Derating Behavior





## 4.2 STP 60-JP-10

### 4.2.1 Efficiency



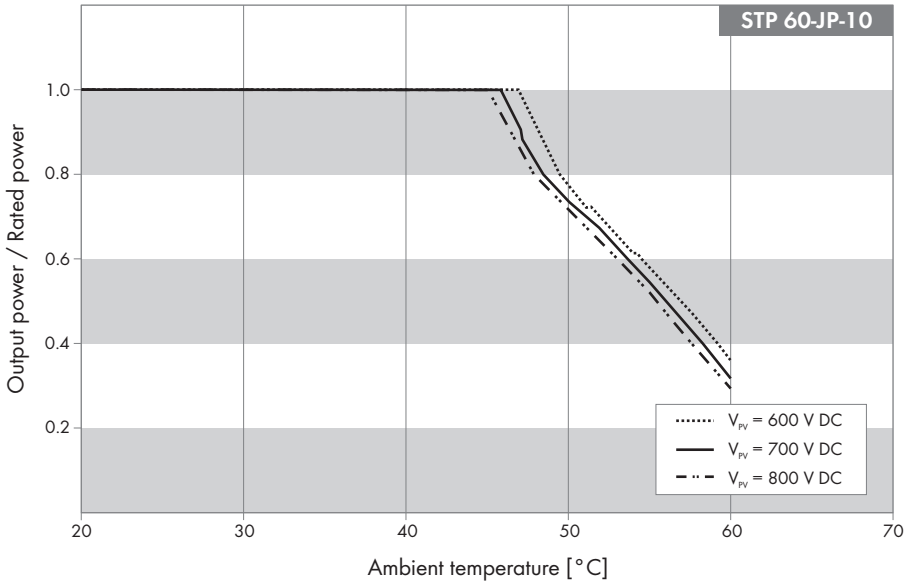
Maximum efficiency,  $\eta_{max}$  98.8 %

Efficiency as per JIS C 8961,  $\eta_{JIS}$  98.0 %

#### Efficiency Profile

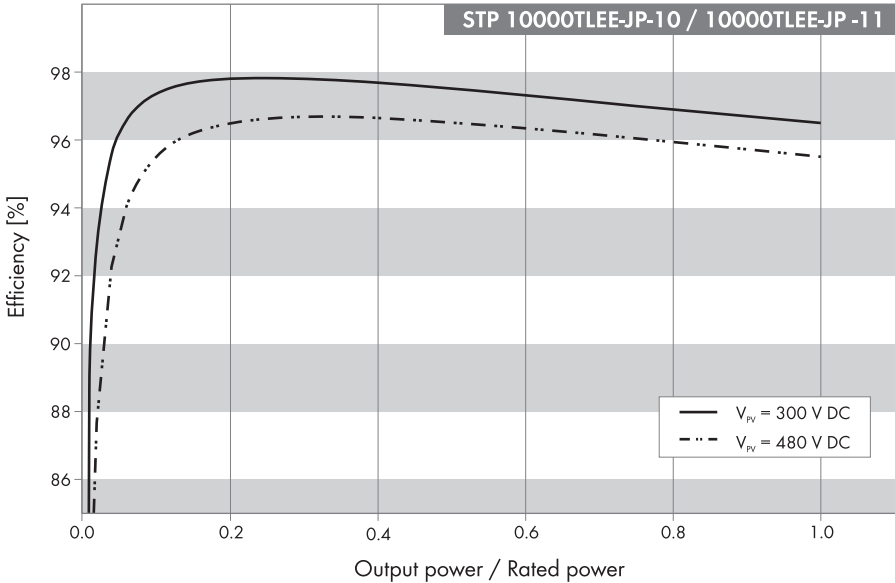
Standardized output power	Efficiency		
	Minimum MPP voltage 600 V	Rated input voltage 630 V	Maximum MPP voltage 800 V
5 %	96.6 %	96.5 %	94.6 %
10 %	98.0 %	97.8 %	96.9 %
20 %	98.6 %	98.4 %	97.9 %
25 %	98.7 %	98.5 %	98.0 %
30 %	98.7 %	98.5 %	98.1 %
50 %	98.6 %	98.5 %	98.0 %
75 %	98.3 %	98.2 %	97.8 %
100 %	98.1 %	98.0 %	97.6 %

### 4.2.2 Derating Behavior



### 4.3 STP 10000TLEE-JP-10 / STP 10000TLEE-JP-11

#### 4.3.1 Efficiency



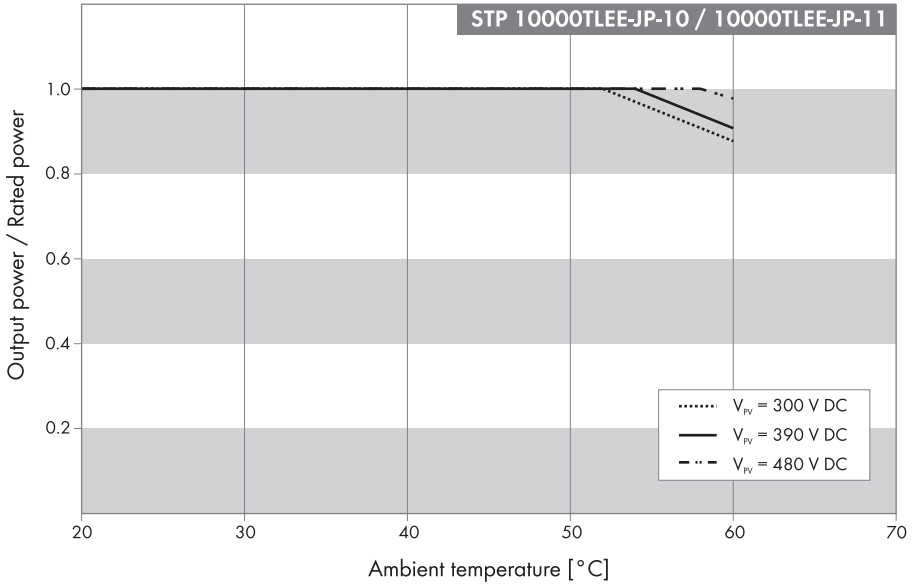
Maximum efficiency,  $\eta_{max}$  97.8 %

Efficiency as per JIS C 8961,  $\eta_{JIS}$  96.5 %

#### Efficiency Profile

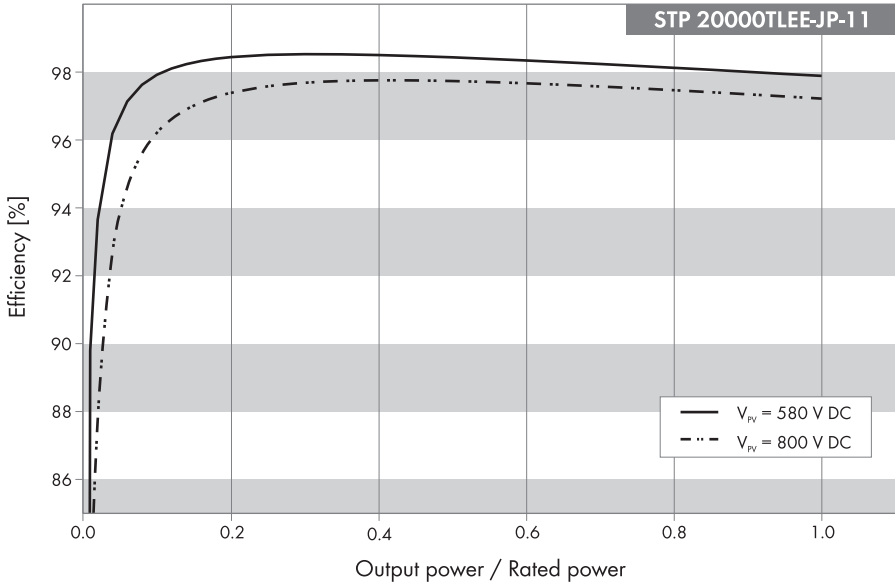
Standardized output power	Efficiency	
	Minimum MPP voltage / rated input voltage 300 V	Maximum MPP voltage 480 V
5 %	96.2 %	93.3 %
10 %	97.4 %	95.5 %
20 %	97.8 %	96.5 %
25 %	97.8 %	96.6 %
30 %	97.8 %	96.7 %
50 %	97.5 %	96.5 %
75 %	97.0 %	96.0 %
100 %	96.4 %	95.5 %

### 4.3.2 Derating Behavior



## 4.4 STP 20000TLEE-JP-1 1

### 4.4.1 Efficiency



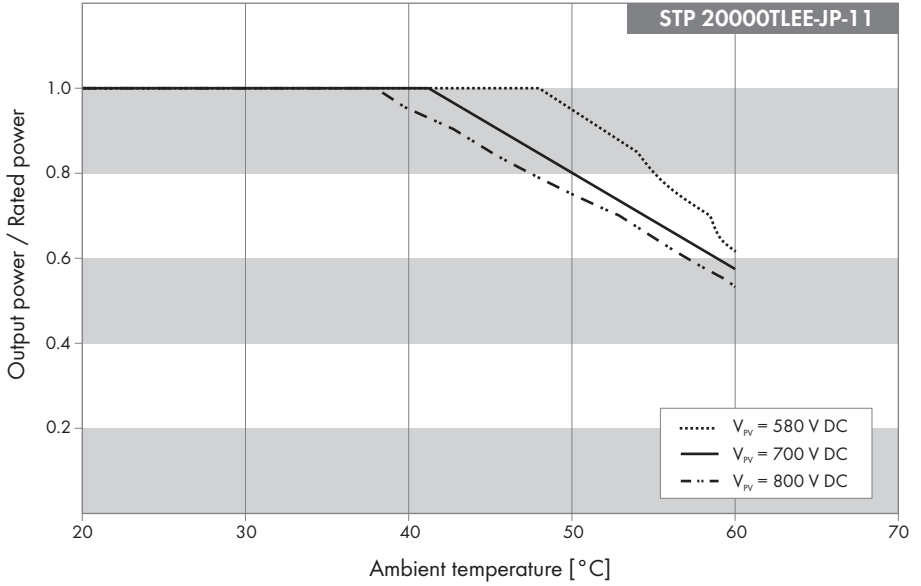
Maximum efficiency,  $\eta_{max}$  98.5 %

Efficiency as per JIS C 8961,  $\eta_{JIS}$  97.5 %

#### Efficiency Profile

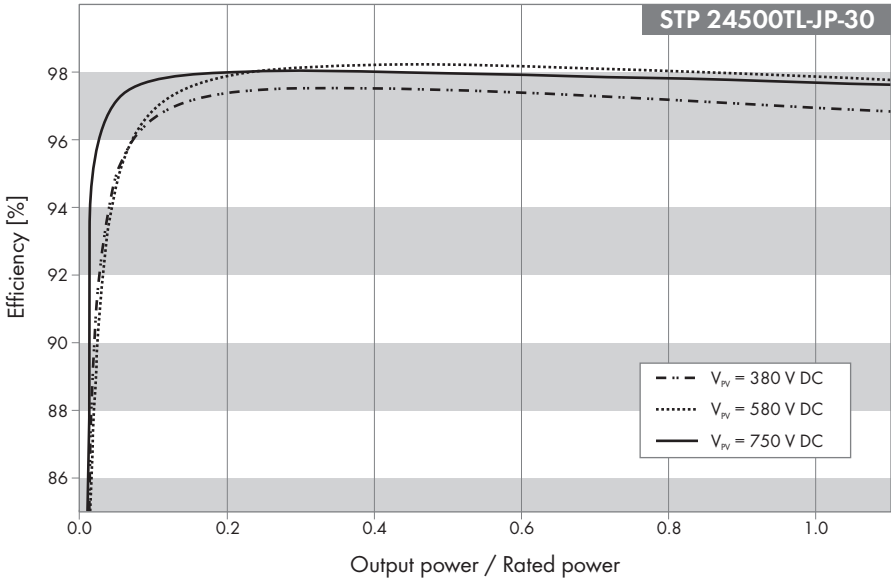
Standardized output power	Efficiency	
	Minimum MPP voltage / rated input voltage 580 V	Maximum MPP voltage 800 V
5 %	96.7 %	93.6 %
10 %	97.9 %	96.2 %
20 %	98.4 %	97.4 %
25 %	98.5 %	97.6 %
30 %	98.5 %	97.7 %
50 %	98.4 %	97.7 %
75 %	98.2 %	97.5 %
100 %	97.9 %	97.2 %

### 4.4.2 Derating Behavior



## 4.5 STP 24500TL-JP-30

### 4.5.1 Efficiency



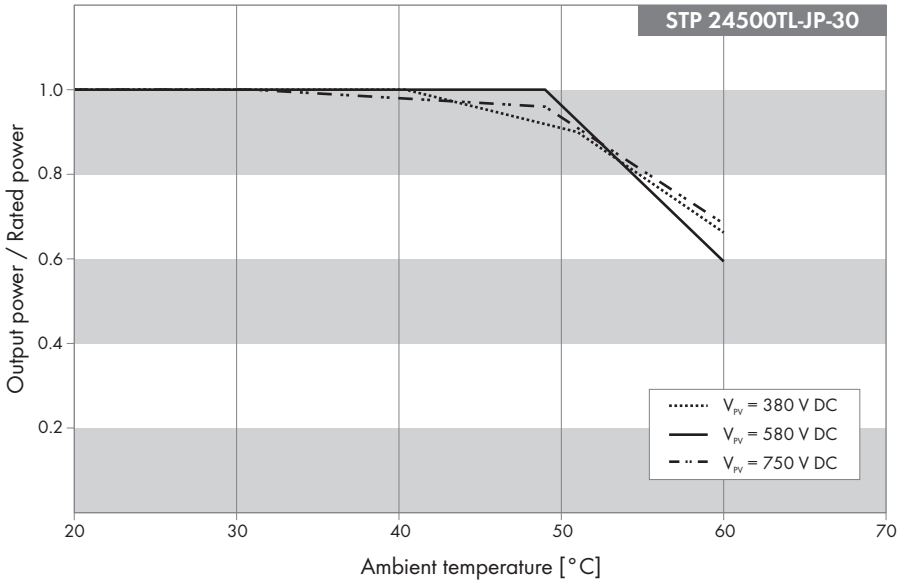
Maximum efficiency,  $\eta_{max}$  98.8 %

Efficiency as per JIS C 8961,  $\eta_{JIS}$  98.0 %

#### Efficiency Profile

Standardized output power	Efficiency		
	Minimum MPP voltage 380 V	Rated input voltage 580 V	Maximum MPP voltage 750 V
5 %	95.2 %	97.2 %	95.1 %
10 %	96.7 %	97.8 %	97.0 %
20 %	97.3 %	98.0 %	97.9 %
25 %	97.4 %	98.0 %	98.1 %
30 %	97.4 %	98.0 %	98.1 %
50 %	97.3 %	97.9 %	98.2 %
75 %	97.0 %	97.7 %	98.0 %
100 %	96.7 %	97.5 %	97.7 %

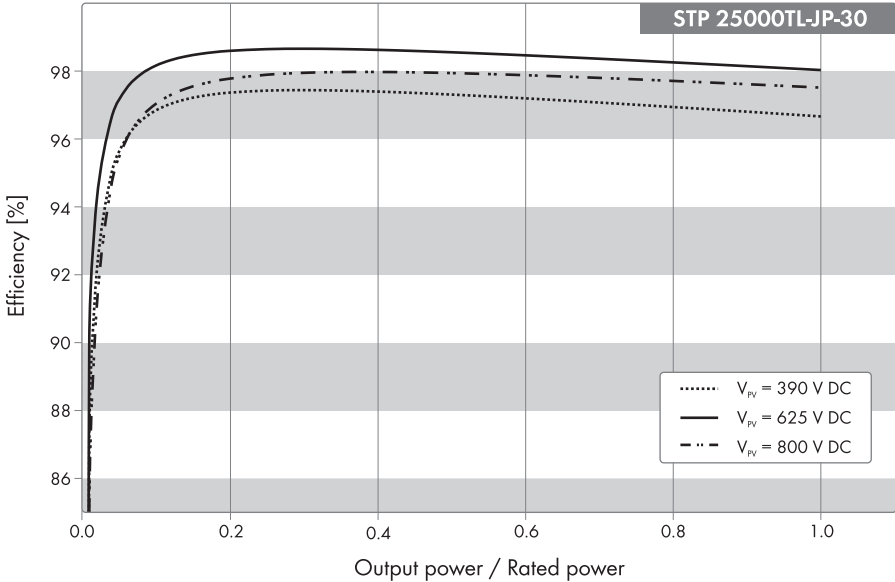
### 4.5.2 Derating Behavior





## 4.6 STP 25000TL-JP-30

### 4.6.1 Efficiency



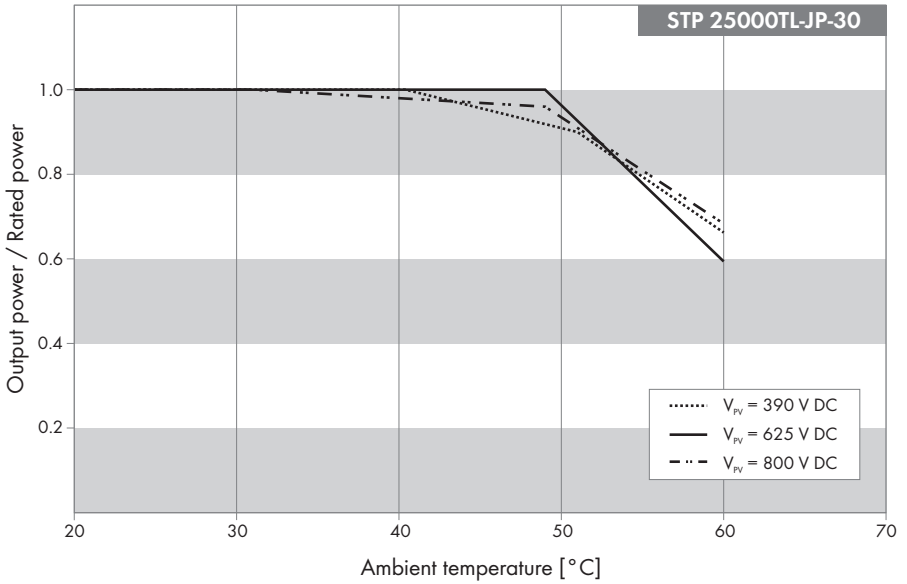
Maximum efficiency,  $\eta_{max}$  98.7 %

Efficiency as per JIS C 8961,  $\eta_{JIS}$  98.0 %

#### Efficiency Profile

Standardized output power	Efficiency		
	Minimum MPP voltage 390 V	Rated input voltage 625 V	Maximum MPP voltage 800 V
5 %	95.6 %	97.1 %	95.4 %
10 %	96.8 %	98.2 %	97.0 %
20 %	97.4 %	98.6 %	97.8 %
25 %	97.4 %	98.6 %	97.9 %
30 %	97.4 %	98.7 %	98.0 %
50 %	97.3 %	98.6 %	97.9 %
75 %	97.0 %	98.3 %	97.8 %
100 %	96.7 %	98.0 %	97.5 %

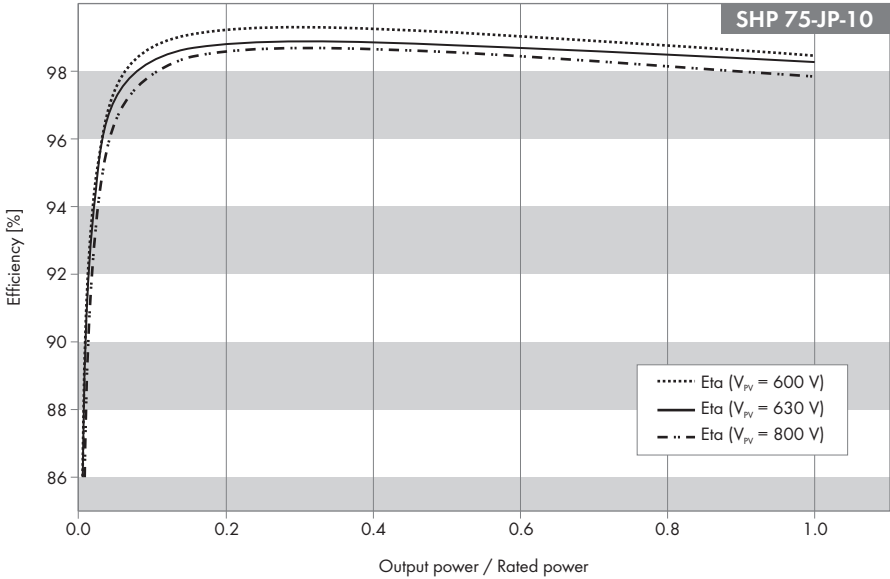
### 4.6.2 Derating Behavior



# 5 Sunny Highpower

## 5.1 SHP 75-JP-10

### 5.1.1 Efficiency



Maximum efficiency,  $\eta_{max}$  98.8 %

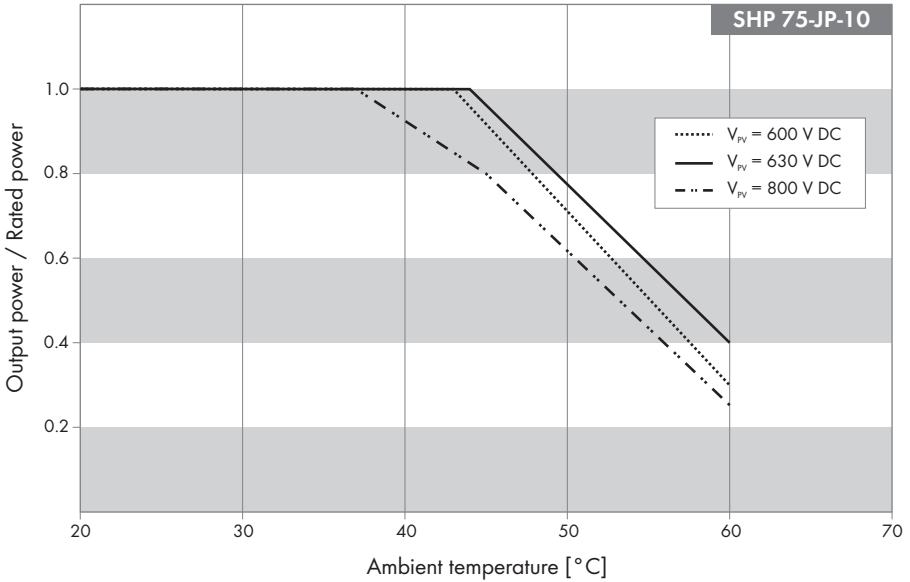
Efficiency as per JIS C 8961,  $\eta_{JIS}$  98.0 %

#### Efficiency Profile

Standardized output power	Efficiency		
	Minimum MPP voltage 600 V	Rated input voltage 630 V	Maximum MPP voltage 800 V
5 %	96.9 %	96.6 %	95.9 %
10 %	98.2 %	97.8 %	97.5 %
20 %	98.8 %	98.3 %	98.1 %
25 %	98.8 %	98.4 %	98.2 %
30 %	98.8 %	98.4 %	98.2 %
50 %	98.7 %	98.3 %	98.1 %

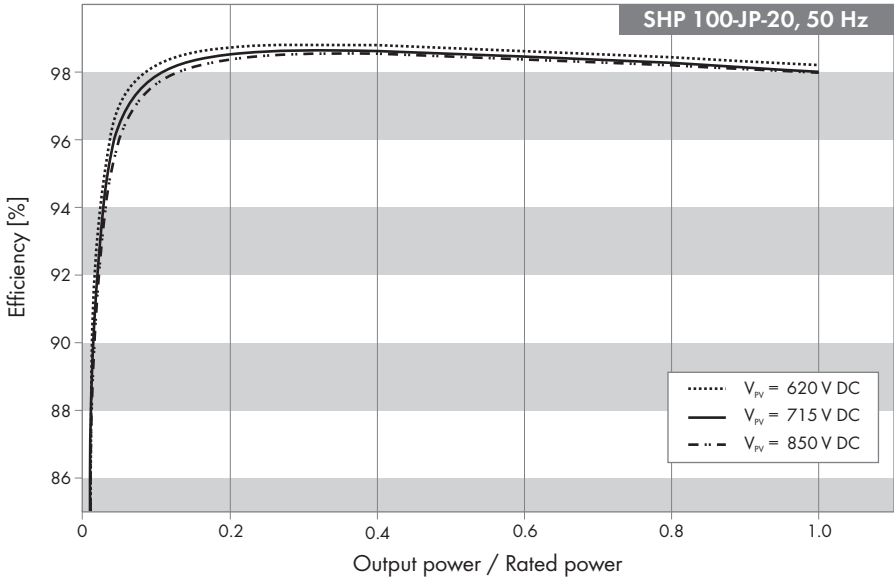
Standardized output power	Efficiency		
	Minimum MPP voltage 600 V	Rated input voltage 630 V	Maximum MPP voltage 800 V
75 %	98.4 %	98.1 %	97.8 %
100 %	98.0 %	97.8 %	97.4 %

### 5.1.2 Derating Behavior



## 5.2 SHP 100-JP-20

### 5.2.1 Efficiency

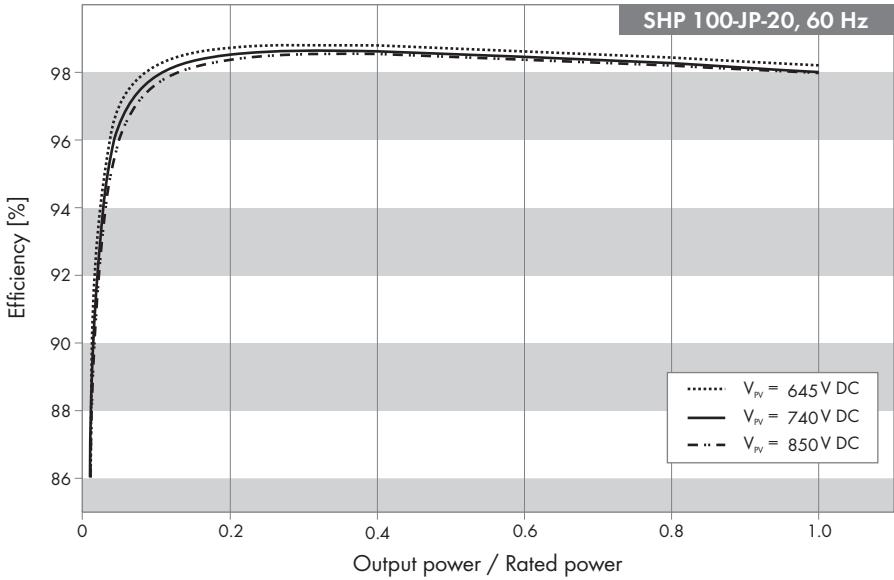


Maximum efficiency,  $\eta_{max}$  98.8 %

Efficiency as per JIS C 8961,  $\eta_{JIS}$  98.0 %

#### Efficiency Profile

Standardized output power	Efficiency		
	MPP Voltage 620 V	MPP Voltage 715 V	MPP Voltage 850 V
5 %	97.0 %	96.5 %	96.0 %
10 %	98.2 %	97.9 %	97.6 %
20 %	98.7 %	98.5 %	98.4 %
25 %	98.8 %	98.6 %	98.5 %
30 %	98.8 %	98.6 %	98.5 %
50 %	98.7 %	98.6 %	98.5 %
75 %	98.5 %	98.3 %	98.2 %
100 %	98.2 %	98.0 %	97.9 %

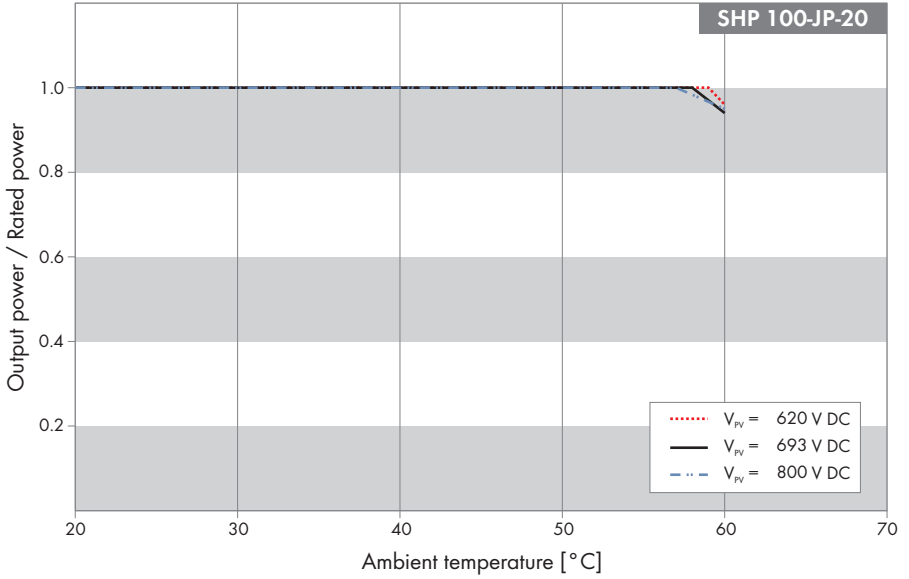


Maximum efficiency, $\eta_{max}$	98.8 %
Efficiency as per JIS C 8961, $\eta_{JIS}$	98.0 %

**Efficiency Profile**

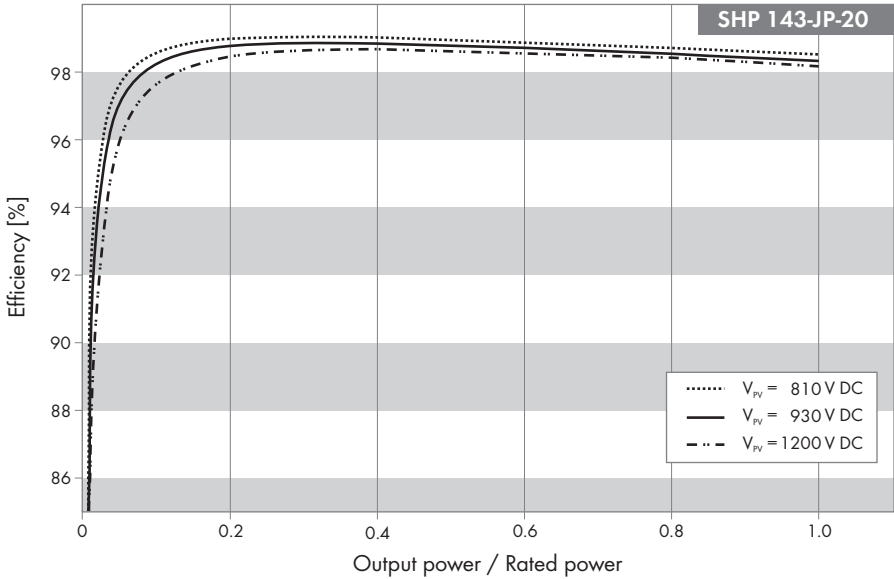
Standardized output power	Efficiency		
	MPP Voltage 645 V	MPP Voltage 740 V	MPP Voltage 850 V
5 %	97.0 %	96.4 %	96.1 %
10 %	98.2 %	97.9 %	97.7 %
20 %	98.7 %	98.5 %	98.4 %
25 %	98.8 %	98.6 %	98.5 %
30 %	98.8 %	98.7 %	98.6 %
50 %	98.8 %	98.6 %	98.5 %
75 %	98.6 %	98.4 %	98.3 %
100 %	98.3 %	98.1 %	98.1 %

### 5.2.2 Derating Behavior



## 5.3 SHP 143-JP-20

### 5.3.1 Efficiency



Maximum efficiency,  $\eta_{max}$  99.0 %

Efficiency as per JIS C 8961,  $\eta_{EU}$  98.5 %

#### Efficiency Profile

Standardized output power	Efficiency		
	MPP Voltage 810 V	MPP Voltage 930 V	MPP Voltage 1200 V
5 %	97.6 %	97.0 %	95.8 %
10 %	98.6 %	98.2 %	97.6 %
20 %	99.0 %	98.8 %	98.4 %
25 %	99.0 %	98.8 %	98.6 %
30 %	99.0 %	98.9 %	98.6 %
50 %	99.0 %	98.8 %	98.6 %
75 %	98.8 %	98.6 %	98.4 %
100 %	98.5 %	98.3 %	98.2 %



### 5.3.2 Derating Behavior

