EN

# 1 Extended technical Data

## 1.1 KACO blueplanet 125 TL3 GEN2

| AC-Power | | | | |
|---|---|---|---|---|
| Inverter power nominal | 125 kVA | | | |
| Inverter power maximal | 137.5 kVA | | | |
| Rated current (In) | 3 x 120.3 A | | | |
| Contribution to continuous short-circuit current (max. output fault current) | 132.3 A | | | |
| Power electronics type | IGBT-MLI (self-commutated) | | | |
| Rated operating voltage | 600 V (3P+PE) | | | |
| cos phi nominal | ≈ 1 | | | |
| Grid connection | Three-phase | | | |
| Impedance bei 165 Hz * | $R_{165\ Hz} \approx 360{,}0\ \Omega$, $X_{165\ Hz} \approx 100{,}0\ \Omega$ | | | |
| Impedance bei 175 Hz * | $R_{175\ Hz} \approx 47{,}0\ \Omega$, $X_{175\ Hz} \approx 360{,}0\ \Omega$ | | | |
| * Scheme in parallel | | | | |

| Operating behaviour in the event of a short circuit at the inverter output | |
|---|---|
| Contribution to peak short-circuit current (îp) | 212 A |
| Contribution to initial short-circuit AC current (Ik'' first single-period RMS value) | 137 A |

| Power quality characteristics | | | | |
|---|---|---|---|---|
| Max. number of switching operations, $N_{10}$ | 10 | | | |
| Max. number of switching operations, $N_{120}$ | 120 | | | |
| Case of switching operation | Cut-in at 10 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,04 | 0,03 | 0,03 | 0,03 |
| Voltage change factor | 0,26 | 0,23 | 0,19 | 0,18 |
| Maximum incrush current factor | 0,029 | | | |
| Maximum incrush current factor (transient only) | 0,02 | | | |
| Case of switching operation | Cut-in at 100 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,05 | 0,05 | 0,05 | 0,05 |
| Voltage change factor | 0,97 | 0,71 | 0,38 | 0,24 |
| Maximum inrush current factor | 0,028 | | | |
| Maximum inrush current factor (transient only) | 0,02 | | | |
| Case of switching operation | Service disconnection at rated power | | | |
| Description of the service disconnection procedure | Disconnection by the DC-switch | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,56 | 0,41 | 0,33 | 0,31 |
| Voltage change factor | 1,06 | 0,75 | 0,42 | 0,49 |
| Maximum inrush current factor | 0,904 | | | |
| Maximum inrush current factor (transient only) | 0,04 | | | |
| Worst case over all switching operations | 0,904 | | | |

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| | |
|---|---|
| Worst case over all switching operations (transient only) | 0,04 |
| Note: $S_{k, fic}/S_n$ in the fictitious grid was set to | 20 |

| Flicker | | | | |
|---|---|---|---|---|
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 1,12 | 1,32 | 1,50 | 1,57 |
| Short term flicker | 0,056 | 0,066 | 0,075 | 0,0785 |
| Note: $S_{k, fic}/S_n$ in the fictitious grid was set to | 20 | | | |

| Injection of DC currents |
|---|
| The inverter has a direct current injection lower than 0,16%, in addition the inverter has a dc current monitoring and trips in case of dc current greater than 1 A in less than 200ms |

| EUT Operative condition | | $I_{dc}$ threshold [mA] | $I_{dc}$ simulated [mA] | Trip time [ma] | Ibcomp L1 [%] | Ibcomp L2 [%] | Ibcomp L3 [%] |
|---|---|---|---|---|---|---|---|
| OC1 | 33 % Pn | 1000 | >1000 | 200 | 0,156 | 0,213 | 0,068 |
| OC2 | 66% Pn | | | | -0,063 | -0,081 | -0,066 |
| OC3 | 100 % Pn | | | | -0,107 | -0,147 | -0,016 |
| % rated AC current | | | | | 0,12 | 0,16 | 0,05 |

*Tab. 1:* DC-Injection measurement values (bp 125 TL3)

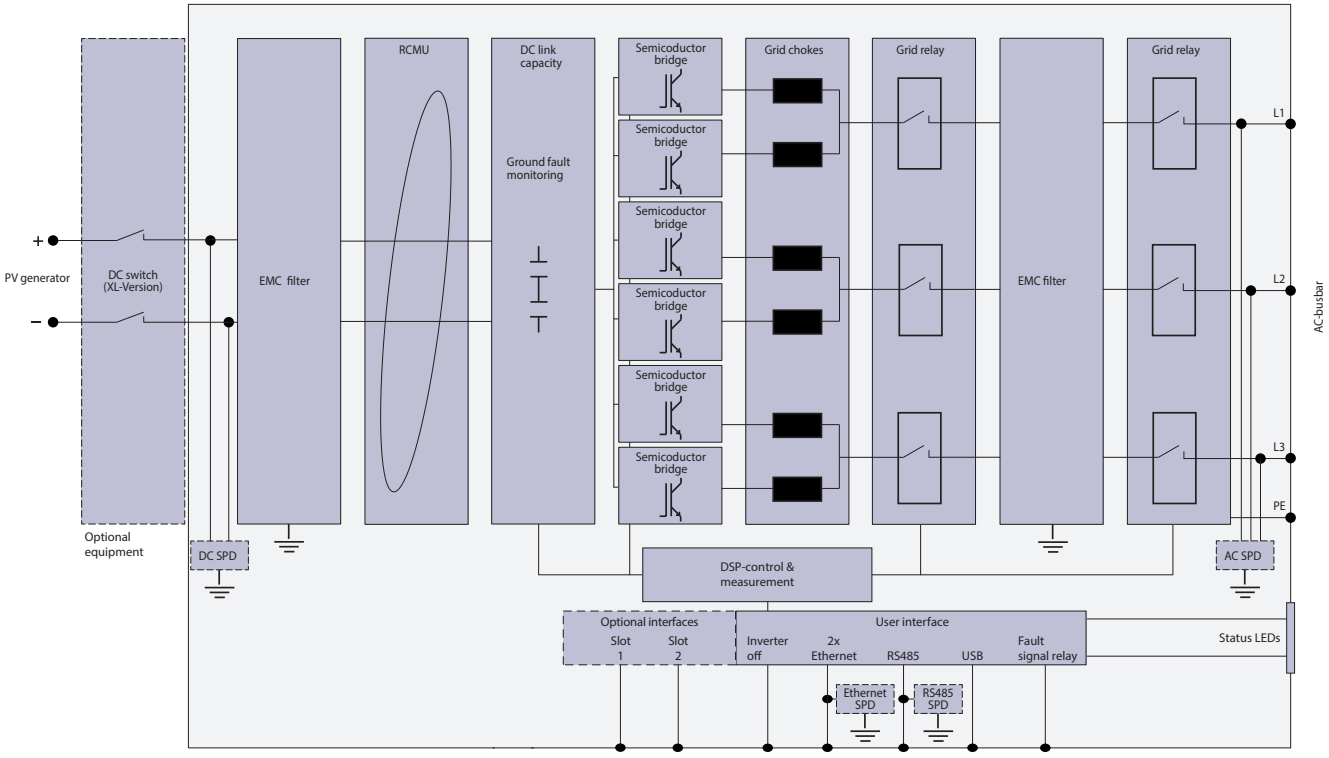



*Fig. 1:* Block schema blueplanet 87.0-165 TL3

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% de In]** | **[A]** | **[% de In]** |
| 1 | 119,213 | 99,10 | 119,212 | 99,10 |
| 2 | 0,276 | 0,23 | 0,244 | 0,20 |
| 3 | 0,095 | 0,08 | 0,093 | 0,08 |
| 4 | 0,117 | 0,10 | 0,126 | 0,10 |
| 5 | 0,911 | 0,76 | 1,006 | 0,84 |
| 6 | 0,108 | 0,09 | 0,109 | 0,09 |

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% de In]** | **[A]** | **[% de In]** |
| 7 | 0,730 | 0,61 | 0,746 | 0,62 |
| 8 | 0,075 | 0,06 | 0,084 | 0,07 |
| 9 | 0,042 | 0,04 | 0,033 | 0,03 |
| 10 | 0,073 | 0,06 | 0,069 | 0,06 |
| 11 | 0,333 | 0,28 | 0,334 | 0,28 |
| 12 | 0,111 | 0,09 | 0,101 | 0,08 |
| 13 | 0,228 | 0,19 | 0,295 | 0,25 |
| 14 | 0,098 | 0,08 | 0,094 | 0,08 |
| 15 | 0,039 | 0,03 | 0,036 | 0,03 |
| 16 | 0,076 | 0,06 | 0,073 | 0,06 |
| 17 | 0,232 | 0,19 | 0,285 | 0,24 |
| 18 | 0,117 | 0,10 | 0,108 | 0,09 |
| 19 | 0,219 | 0,18 | 0,265 | 0,22 |
| 20 | 0,097 | 0,08 | 0,107 | 0,09 |
| 21 | 0,042 | 0,03 | 0,045 | 0,04 |
| 22 | 0,078 | 0,06 | 0,082 | 0,07 |
| 23 | 0,195 | 0,16 | 0,238 | 0,20 |
| 24 | 0,102 | 0,08 | 0,102 | 0,09 |
| 25 | 0,172 | 0,14 | 0,206 | 0,17 |
| 26 | 0,096 | 0,08 | 0,100 | 0,08 |
| 27 | 0,044 | 0,04 | 0,042 | 0,04 |
| 28 | 0,078 | 0,07 | 0,077 | 0,06 |
| 29 | 0,181 | 0,15 | 0,200 | 0,17 |
| 30 | 0,092 | 0,08 | 0,093 | 0,08 |
| 31 | 0,156 | 0,13 | 0,168 | 0,14 |
| 32 | 0,091 | 0,08 | 0,085 | 0,07 |
| 33 | 0,043 | 0,04 | 0,039 | 0,03 |
| 34 | 0,071 | 0,06 | 0,068 | 0,06 |
| 35 | 0,138 | 0,11 | 0,141 | 0,12 |
| 36 | 0,078 | 0,06 | 0,068 | 0,06 |
| 37 | 0,120 | 0,10 | 0,122 | 0,10 |
| 38 | 0,077 | 0,06 | 0,070 | 0,06 |
| 39 | 0,038 | 0,03 | 0,032 | 0,03 |
| 40 | 0,062 | 0,05 | 0,056 | 0,05 |
| 41 | 0,112 | 0,09 | 0,105 | 0,09 |
| 42 | 0,064 | 0,05 | 0,054 | 0,05 |
| 43 | 0,094 | 0,08 | 0,088 | 0,07 |
| 44 | 0,065 | 0,05 | 0,055 | 0,05 |
| 45 | 0,027 | 0,02 | 0,025 | 0,02 |
| 46 | 0,053 | 0,04 | 0,044 | 0,04 |
| 47 | 0,080 | 0,07 | 0,074 | 0,06 |
| 48 | 0,054 | 0,04 | 0,044 | 0,04 |
| 49 | 0,062 | 0,05 | 0,057 | 0,05 |
| 50 | 0,053 | 0,04 | 0,044 | 0,04 |

*Tab. 2:* Harmonics 50 Hz and 60 Hz

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## Deratingverhalten

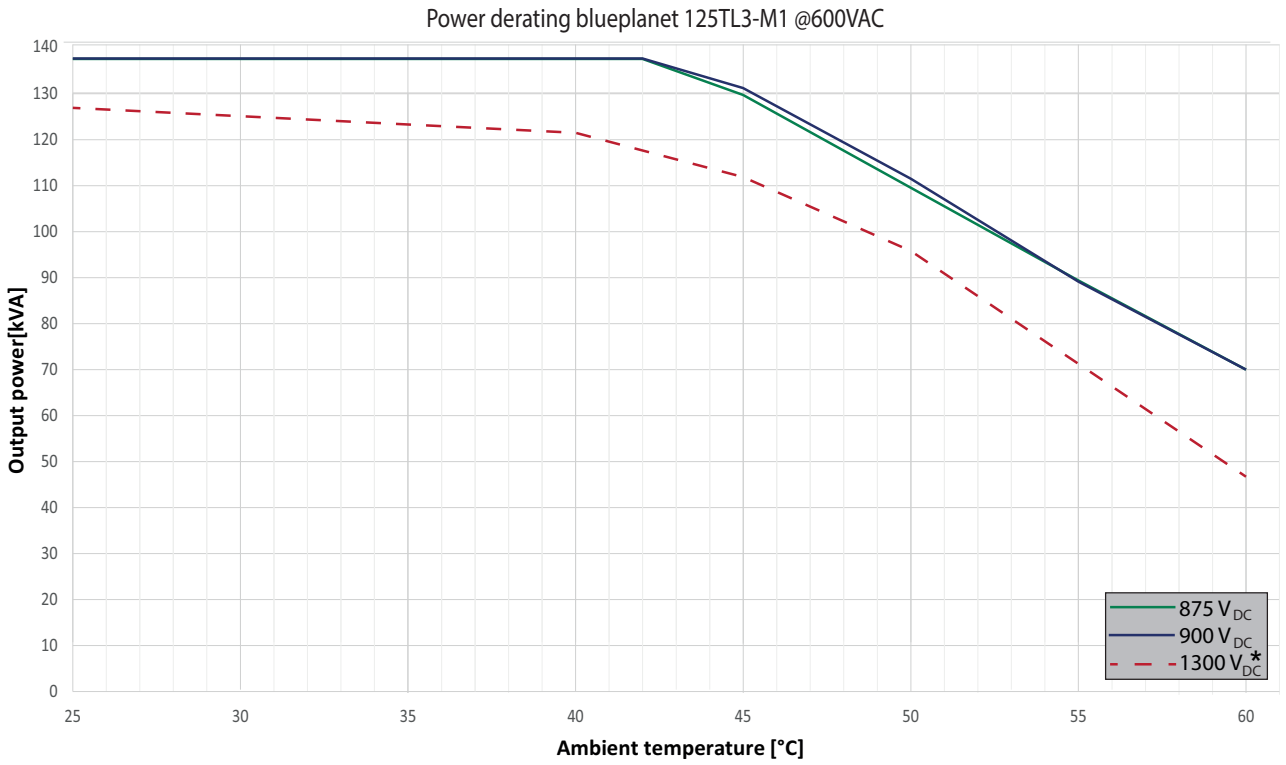



*Fig. 2:* Power derating blueplanet 125 TL3

**) Due to the thermal characteristics of solar modules an operational DC voltage of 1300VDC is not to be expected at higher ambient temperatures in the vast majority of system designs.*

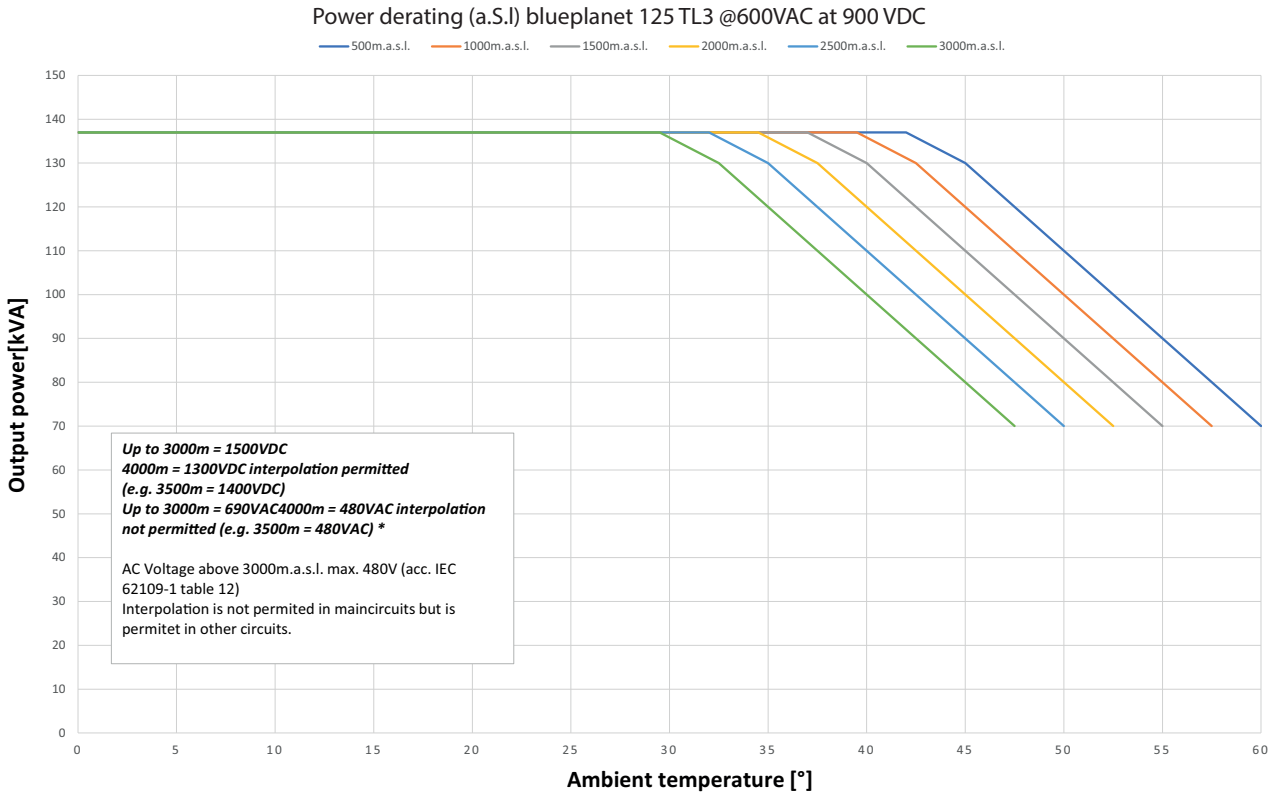



*Fig. 3:* Power reduction in relation to the height above sea level blueplanet 125 TL3

**) The provided values are simulation results and may vary from actual performance data under real operating conditions.*

## Efficiency characteristic

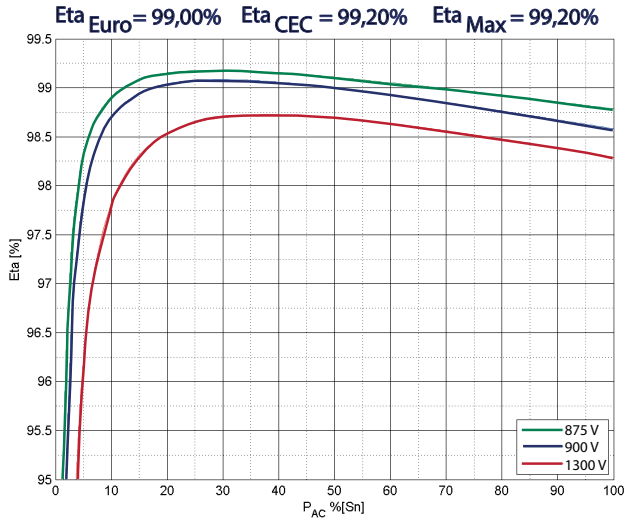



*Fig. 4:* 2D Diagram blueplanet 125 TL3

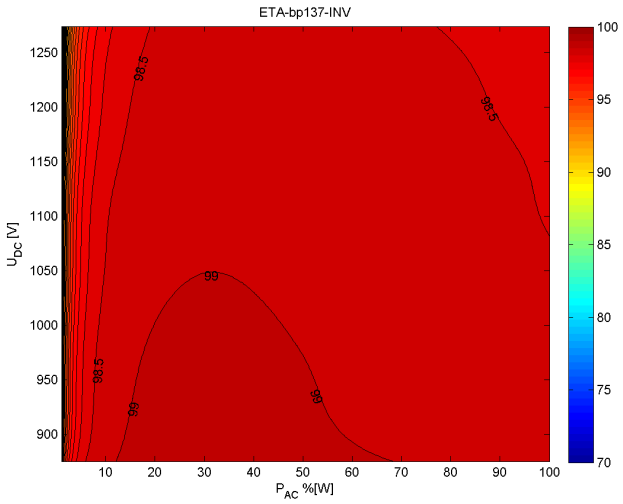



*Fig. 5:* 3D Diagram blueplanet 125 TL3

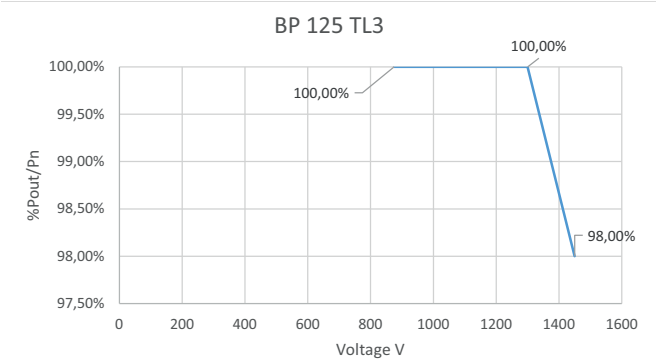



*Fig. 6:* 2D Diagram %Pout/Pn vs Voltage 125 TL3

## P-Q Diagram depanding on operating voltage

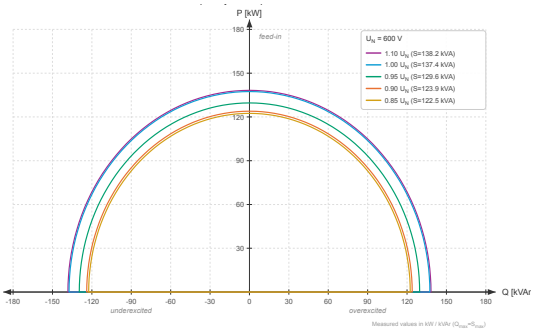



*Fig. 7:* P-Q operating range for bp 125 TL3 ($Q_{max}$=$S_{max}$)

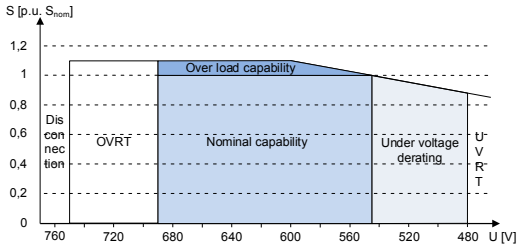



*Fig. 8:* Apparent power subject to the grid voltage for bp 125 TL3

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## 1.2 KACO blueplanet 125 TL3 US-S

| AC-Power | | | | |
|---|---|---|---|---|
| Inverter power nominal | 125 kVA | | | |
| Inverter power maximal | 125 kVA | | | |
| Rated current (In) | 3 x 120.3 A | | | |
| Short circuit current continuous (max output fault current) | 212 A | | | |
| Power electronics type | IGBT-MLI (self-commutated) | | | |
| Rated operating voltage | 600 V (3P+PE) | | | |
| cos phi nominal | ≈ 1 | | | |
| Grid connection | Three-phase | | | |
| Impedance at 165 Hz * | R175 Hz ≈ 47,0 Ω, X175 Hz ≈ 360,0 Ω | | | |
| Impedance at 175 Hz * | R165 Hz ≈ 360,0 Ω, X165 Hz ≈ 100,0 Ω | | | |
| * Scheme in parallel | | | | |

| Operating behaviour in the event of a short circuit at the inverter output | |
|---|---|
| Contribution to peak short-circuit current (îp) | 212 A |
| Contribution to initial short-circuit AC current (Ik'' first single-period RMS value) | 137 A |

| Power quality characteristics | | | | |
|---|---|---|---|---|
| Max. number of switching operations, $N_{10}$ | 10 | | | |
| Max. number of switching operations, $N_{120}$ | 120 | | | |
| Case of switching operation | Cut-in at 10 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,04 | 0,03 | 0,03 | 0,03 |
| Voltage change factor | 0,26 | 0,23 | 0,19 | 0,18 |
| Maximum incrush current factor | 0,029 | | | |
| Maximum incrush current factor (transient only) | 0,02 | | | |

| Case of switching operation | Cut-in at 100 % of rated power | | | |
|---|---|---|---|---|
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,05 | 0,05 | 0,05 | 0,05 |
| Voltage change factor | 0,97 | 0,71 | 0,38 | 0,24 |
| Maximum inrush current factor | 0,028 | | | |
| Maximum inrush current factor (transient only) | 0,02 | | | |

| Case of switching operation | Service disconnection at rated power | | | |
|---|---|---|---|---|
| Description of the service disconnection procedure | Disconnection by the DC-switch | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,56 | 0,41 | 0,33 | 0,31 |
| Voltage change factor | 1,06 | 0,75 | 0,42 | 0,49 |
| Maximum inrush current factor | 0,904 | | | |
| Maximum inrush current factor (transient only) | 0,04 | | | |
| Worst case over all switching operations | 0,904 | | | |
| Worst case over all switching operations (transient only) | 0,04 | | | |

| | |
|---|---|
| Note: $S_{k,fic}/S_n$ in the fictitious grid was set to | 20 |

| Flicker | | | | |
|---|---|---|---|---|
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 1,12 | 1,32 | 1,50 | 1,57 |
| Short term flicker | 0,056 | 0,066 | 0,075 | 0,0785 |
| Note: $S_{k,fic}/S_n$ in the fictitious grid was set to | 20 | | | |

| Injection of DC currents |
|---|
| The inverter has a direct current injection lower than 0,16%, in addition the inverter has a dc current monitoring and trips in case of dc current greater than 1 A in less than 200ms |

| EUT Operative condition | | $I_{dc}$ threshold [mA] | $I_{dc}$ simulated [mA] | Trip time [ma] | Ibcomp L1 [%] | Ibcomp L2 [%] | Ibcomp L3 [%] |
|---|---|---|---|---|---|---|---|
| OC1 | 33 % Pn | 1000 | >1000 | 200 | 0,156 | 0,213 | 0,068 |
| OC2 | 66% Pn | | | | -0,063 | -0,081 | -0,066 |
| OC3 | 100 % Pn | | | | -0,107 | -0,147 | -0,016 |
| % rated AC current | | | | | 0,12 | 0,16 | 0,05 |

*Tab. 3:* DC-Injection measurement values (bp 125 TL3)

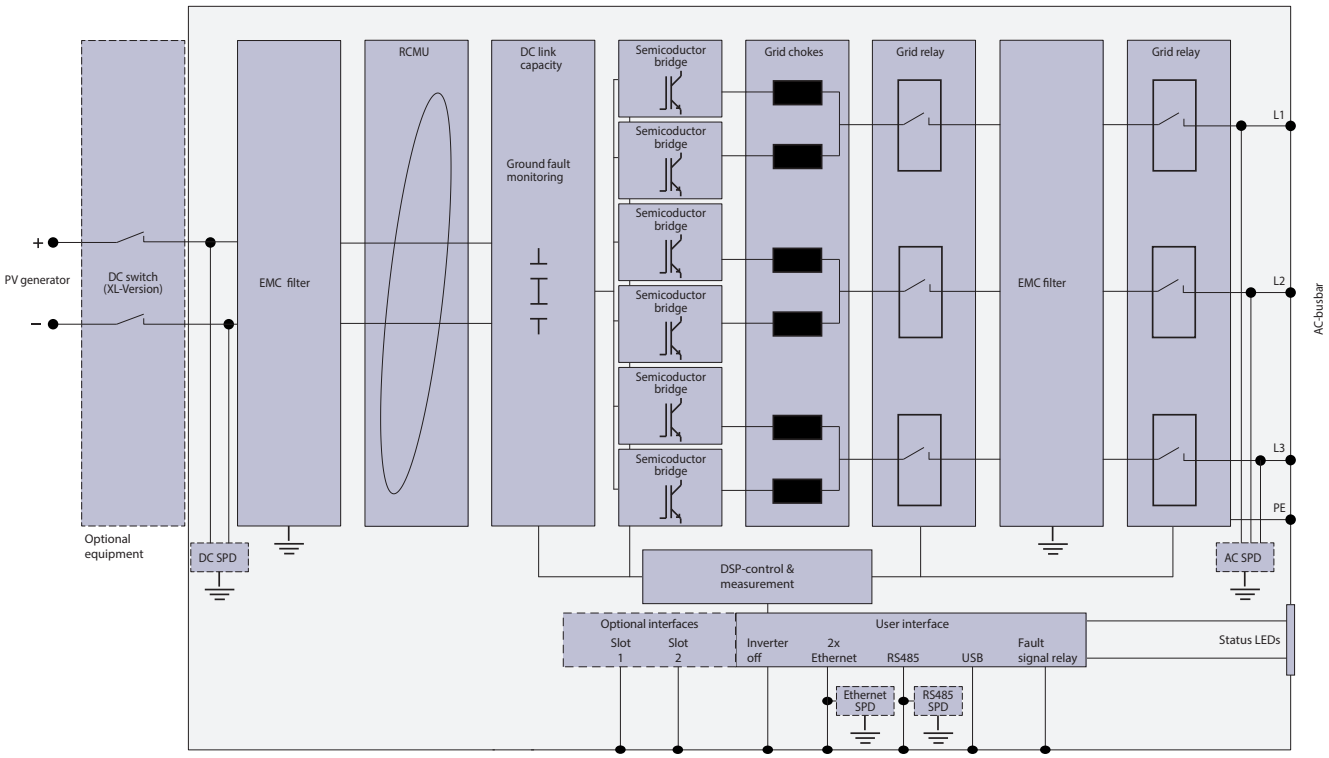



*Fig. 9:* Block schema blueplanet 87.0-165 TL3

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% de In]** | **[A]** | **[% de In]** |
| 1 | 130,917 | 98,95 | 130,945 | 98,98 |
| 2 | 0,285 | 0,22 | 0,237 | 0,18 |
| 3 | 0,099 | 0,07 | 0,093 | 0,07 |
| 4 | 0,135 | 0,10 | 0,145 | 0,11 |
| 5 | 0,938 | 0,71 | 1,042 | 0,79 |
| 6 | 0,103 | 0,08 | 0,103 | 0,08 |
| 7 | 0,681 | 0,51 | 0,693 | 0,52 |
| 8 | 0,076 | 0,06 | 0,076 | 0,06 |

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| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% de In]** | **[A]** | **[% de In]** |
| 9 | 0,035 | 0,03 | 0,037 | 0,03 |
| 10 | 0,070 | 0,05 | 0,068 | 0,05 |
| 11 | 0,320 | 0,24 | 0,339 | 0,26 |
| 12 | 0,107 | 0,08 | 0,106 | 0,08 |
| 13 | 0,241 | 0,18 | 0,297 | 0,22 |
| 14 | 0,089 | 0,07 | 0,095 | 0,07 |
| 15 | 0,039 | 0,03 | 0,034 | 0,03 |
| 16 | 0,072 | 0,05 | 0,075 | 0,06 |
| 17 | 0,233 | 0,18 | 0,290 | 0,22 |
| 18 | 0,117 | 0,09 | 0,111 | 0,08 |
| 19 | 0,219 | 0,17 | 0,266 | 0,20 |
| 20 | 0,095 | 0,07 | 0,097 | 0,07 |
| 21 | 0,041 | 0,03 | 0,039 | 0,03 |
| 22 | 0,082 | 0,06 | 0,085 | 0,06 |
| 23 | 0,198 | 0,15 | 0,244 | 0,18 |
| 24 | 0,099 | 0,07 | 0,105 | 0,08 |
| 25 | 0,177 | 0,13 | 0,213 | 0,16 |
| 26 | 0,097 | 0,07 | 0,095 | 0,07 |
| 27 | 0,050 | 0,04 | 0,039 | 0,03 |
| 28 | 0,078 | 0,06 | 0,083 | 0,06 |
| 29 | 0,182 | 0,14 | 0,205 | 0,16 |
| 30 | 0,092 | 0,07 | 0,092 | 0,07 |
| 31 | 0,158 | 0,12 | 0,175 | 0,13 |
| 32 | 0,087 | 0,07 | 0,083 | 0,06 |
| 33 | 0,042 | 0,03 | 0,033 | 0,02 |
| 34 | 0,071 | 0,05 | 0,070 | 0,05 |
| 35 | 0,141 | 0,11 | 0,149 | 0,11 |
| 36 | 0,075 | 0,06 | 0,072 | 0,05 |
| 37 | 0,124 | 0,09 | 0,127 | 0,10 |
| 38 | 0,077 | 0,06 | 0,067 | 0,05 |
| 39 | 0,034 | 0,03 | 0,027 | 0,02 |
| 40 | 0,062 | 0,05 | 0,057 | 0,04 |
| 41 | 0,117 | 0,09 | 0,113 | 0,09 |
| 42 | 0,064 | 0,05 | 0,059 | 0,04 |
| 43 | 0,097 | 0,07 | 0,092 | 0,07 |
| 44 | 0,063 | 0,05 | 0,055 | 0,04 |
| 45 | 0,029 | 0,02 | 0,021 | 0,02 |
| 46 | 0,054 | 0,04 | 0,046 | 0,03 |
| 47 | 0,086 | 0,06 | 0,079 | 0,06 |
| 48 | 0,053 | 0,04 | 0,047 | 0,04 |
| 49 | 0,067 | 0,05 | 0,063 | 0,05 |
| 50 | 0,053 | 0,04 | 0,044 | 0,03 |

*Tab. 4:* Harmonics 50 Hz and 60 Hz

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## Deratingverhalten

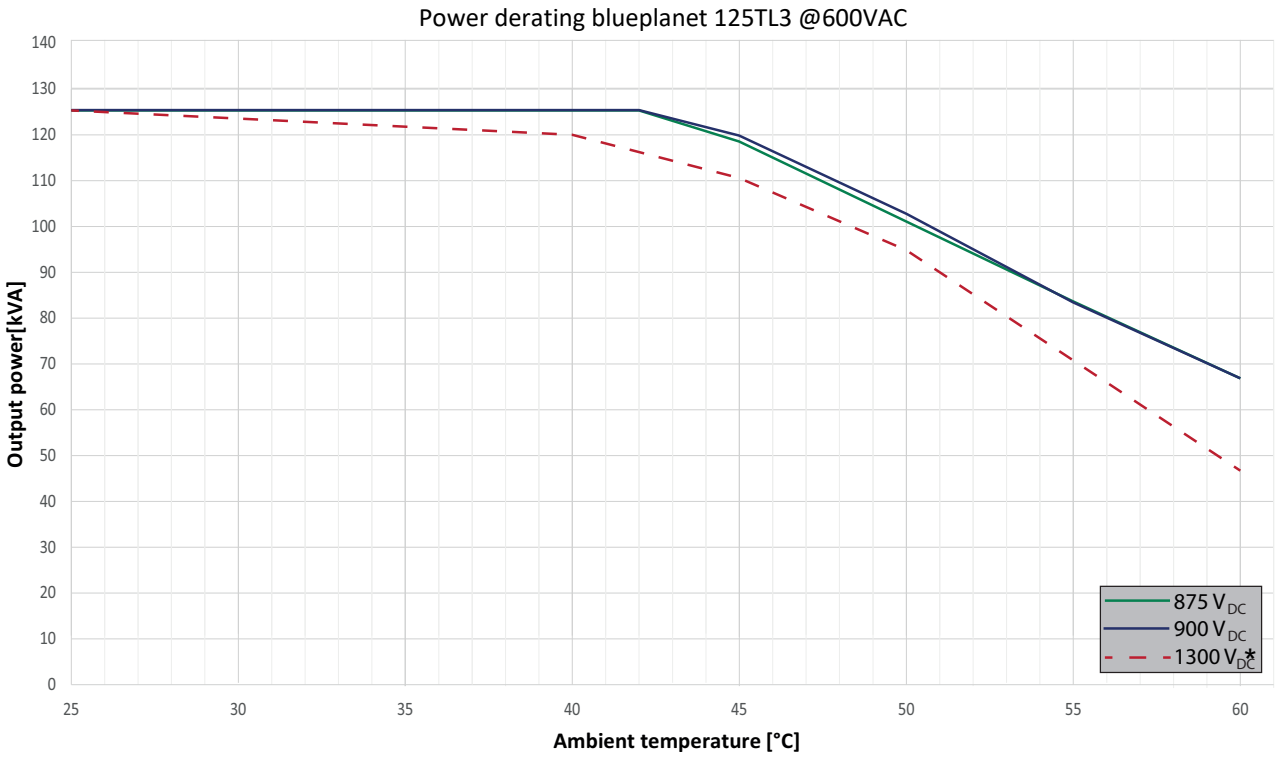



*Fig. 10:* Power derating blueplanet 125 TL3 US-S

**) Due to the thermal characteristics of solar modules an operational DC voltage of 1300VDC is not to be expected at higher ambient temperatures in the vast majority of system designs.*

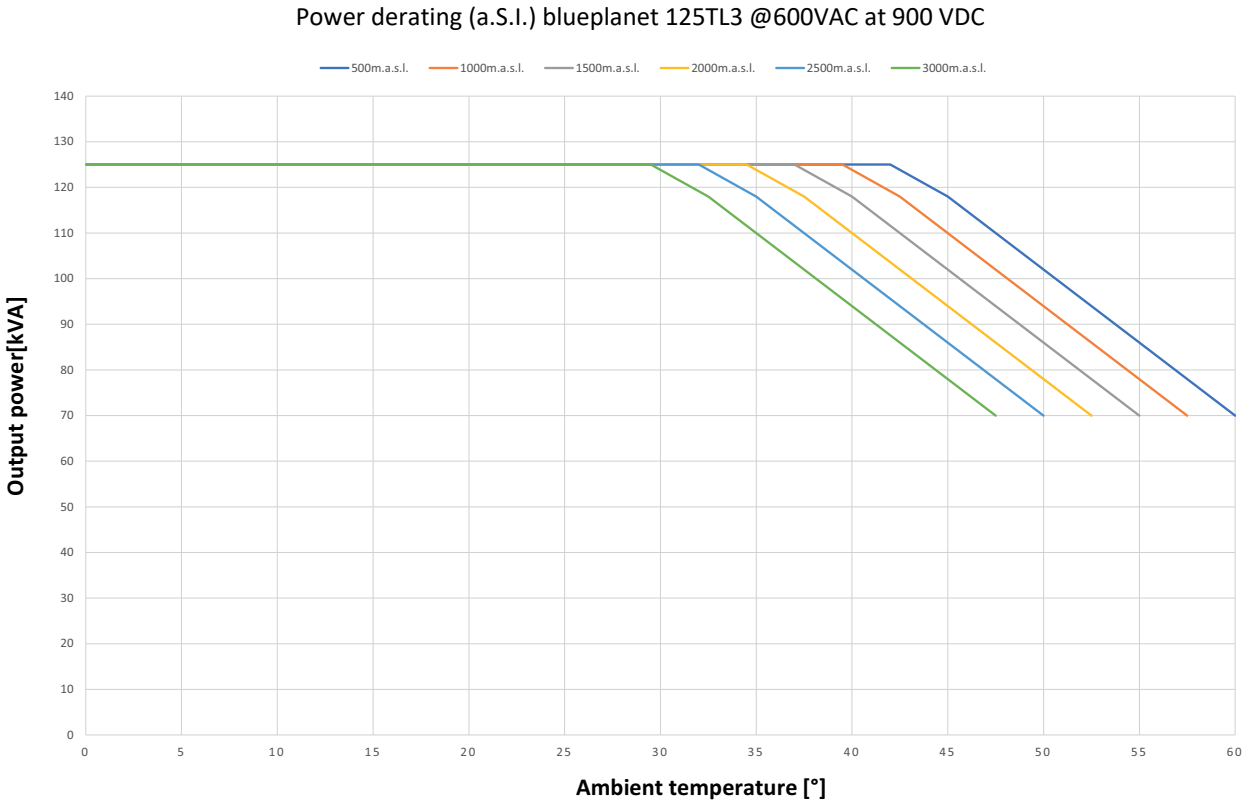



*Fig. 11:* Power reduction in relation to the height above sea level blueplanet 125 TL3 a S I US-S

**) The provided values are simulation results and may vary from actual performance data under real operating conditions.*

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## Efficiency characteristic

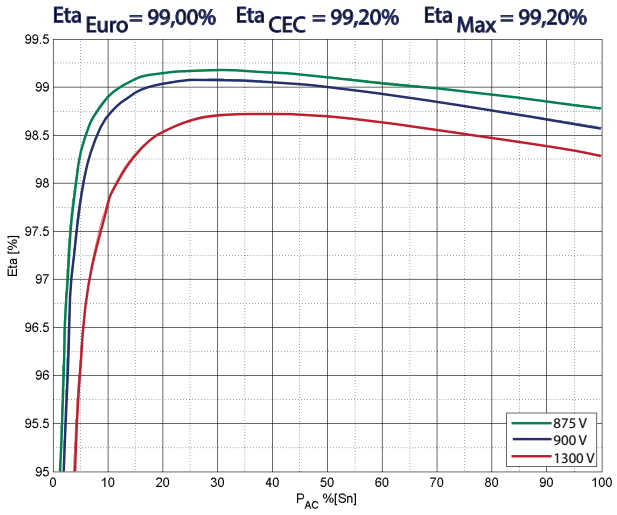



*Fig. 12:* 2D Diagram blueplanet 125TL3 US-S

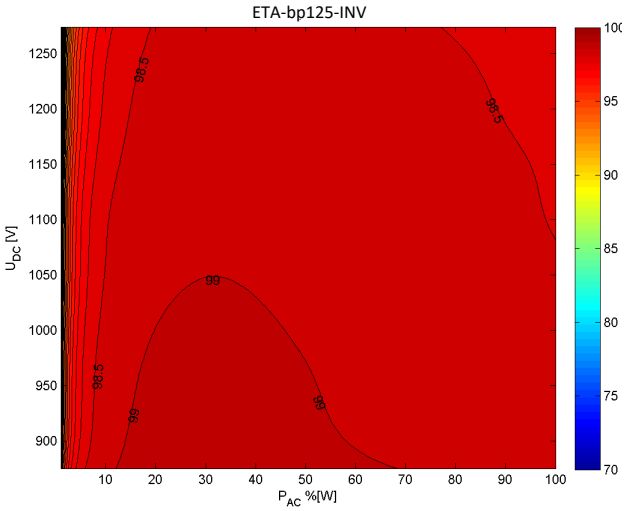



*Fig. 13:* 3D Diagram blueplanet 125TL3 US-S

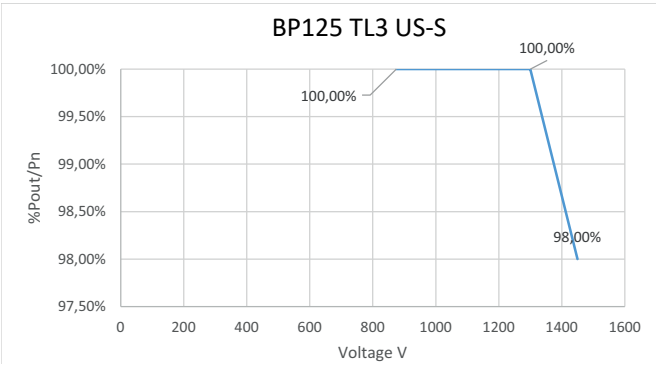



*Fig. 14:* 2D Diagram %Pout/Pn vs Voltage 125 TL3 US-S

## P-Q Diagram depanding on operating voltage

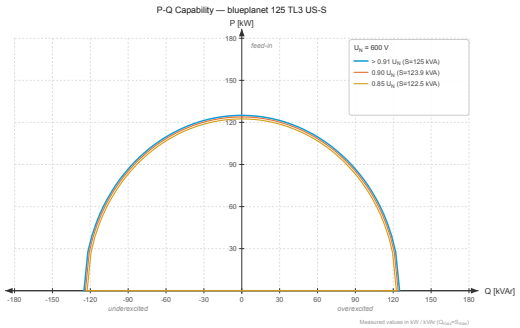



*Fig. 15:* P-Q Operating Range for bp 125 TL3 US-S ($Q_{max}$=$S_{max}$)

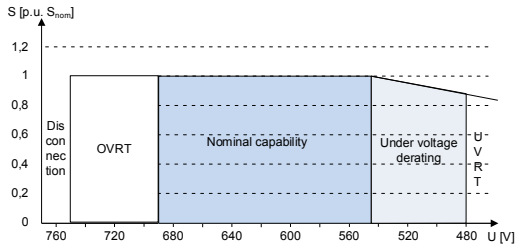



*Fig. 16:* Apparent Power as a Function of Grid Voltage for bp 125 TL3 US-S

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## 1.3 KACO blueplanet 137 TL3 GEN2

| AC-Power | | | | |
|---|---|---|---|---|
| Inverter power nominal | 137 kVA | | | |
| Inverter power maximal | 137.5 kVA | | | |
| Rated current (In) | 3 x 132.3 A | | | |
| Short circuit current (Ik'' First cycle RMS value) | 137 A | | | |
| Short circuit current continuous (max output fault current) | 132.3 A | | | |
| Power electronics type | IGBT-MLI (self-commutated) | | | |
| Rated operating voltage | 600 V (3P+PE) | | | |
| cos phi nominal | ≈ 1 | | | |
| Grid connection | Three-phase | | | |
| Impedance at 165 Hz * | $R_{165\ Hz} \approx 360{,}0\ \Omega$, $X_{165\ Hz} \approx 100{,}0\ \Omega$ | | | |
| Impedance at 175 Hz * | $R_{175\ Hz} \approx 47{,}0\ \Omega$, $X_{175\ Hz} \approx 360{,}0\ \Omega$ | | | |
| * Scheme in parallel | | | | |

| Operating behaviour in the event of a short circuit at the inverter output | |
|---|---|
| Contribution to peak short-circuit current (îp) | 212 A |
| Contribution to initial short-circuit AC current (Ik'' first single-period RMS value) | 137 A |

| Power quality characteristics | | | | |
|---|---|---|---|---|
| Max. number of switching operations, $N_{10}$ | 10 | | | |
| Max. number of switching operations, $N_{120}$ | 120 | | | |
| Case of switching operation | Cut-in at 10 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,04 | 0,03 | 0,03 | 0,03 |
| Voltage change factor | 0,26 | 0,23 | 0,19 | 0,18 |
| Maximum incrush current factor | 0,029 | | | |
| Maximum incrush current factor (transient only) | 0,02 | | | |

| Case of switching operation | Cut-in at 100 % of rated power | | | |
|---|---|---|---|---|
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,05 | 0,05 | 0,05 | 0,05 |
| Voltage change factor | 0,97 | 0,71 | 0,38 | 0,24 |
| Maximum inrush current factor | 0,028 | | | |
| Maximum inrush current factor (transient only) | 0,02 | | | |

| Case of switching operation | Service disconnection at rated power | | | |
|---|---|---|---|---|
| Description of the service disconnection procedure | Disconnection by the DC-switch | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,56 | 0,41 | 0,33 | 0,31 |
| Voltage change factor | 1,06 | 0,75 | 0,42 | 0,49 |
| Maximum inrush current factor | 0,904 | | | |
| Maximum inrush current factor (transient only) | 0,04 | | | |
| Worst case over all switching operations | 0,904 | | | |

EN

| | |
|---|---|
| Worst case over all switching operations (transient only) | 0,04 |
| Note: $S_{k, fic}/S_n$ in the fictitious grid was set to | 20 |

| Flicker | | | | |
|---|---|---|---|---|
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 1,12 | 1,32 | 1,50 | 1,57 |
| Short term flicker | 0,056 | 0,066 | 0,075 | 0,0785 |
| Note: $S_{k, fic}/S_n$ in the fictitious grid was set to | 20 | | | |

| Injection of DC currents |
|---|
| The inverter has a direct current injection lower than 0,16%, in addition the inverter has a dc current monitoring and trips in case of dc current greater than 1 A in less than 200ms |

| EUT Operative condition | | $I_{dc}$ threshold [mA] | $I_{dc}$ simulated [mA] | Trip time [ma] | Ibcomp L1 [%] | Ibcomp L2 [%] | Ibcomp L3 [%] |
|---|---|---|---|---|---|---|---|
| OC1 | 33 % Pn | 1000 | >1000 | 200 | 0,156 | 0,213 | 0,068 |
| OC2 | 66% Pn | | | | -0,063 | -0,081 | -0,066 |
| OC3 | 100 % Pn | | | | -0,107 | -0,147 | -0,016 |
| % rated AC current | | | | | 0,12 | 0,16 | 0,05 |

*Tab. 5:* DC-Injection measurement values (bp 125 TL3)

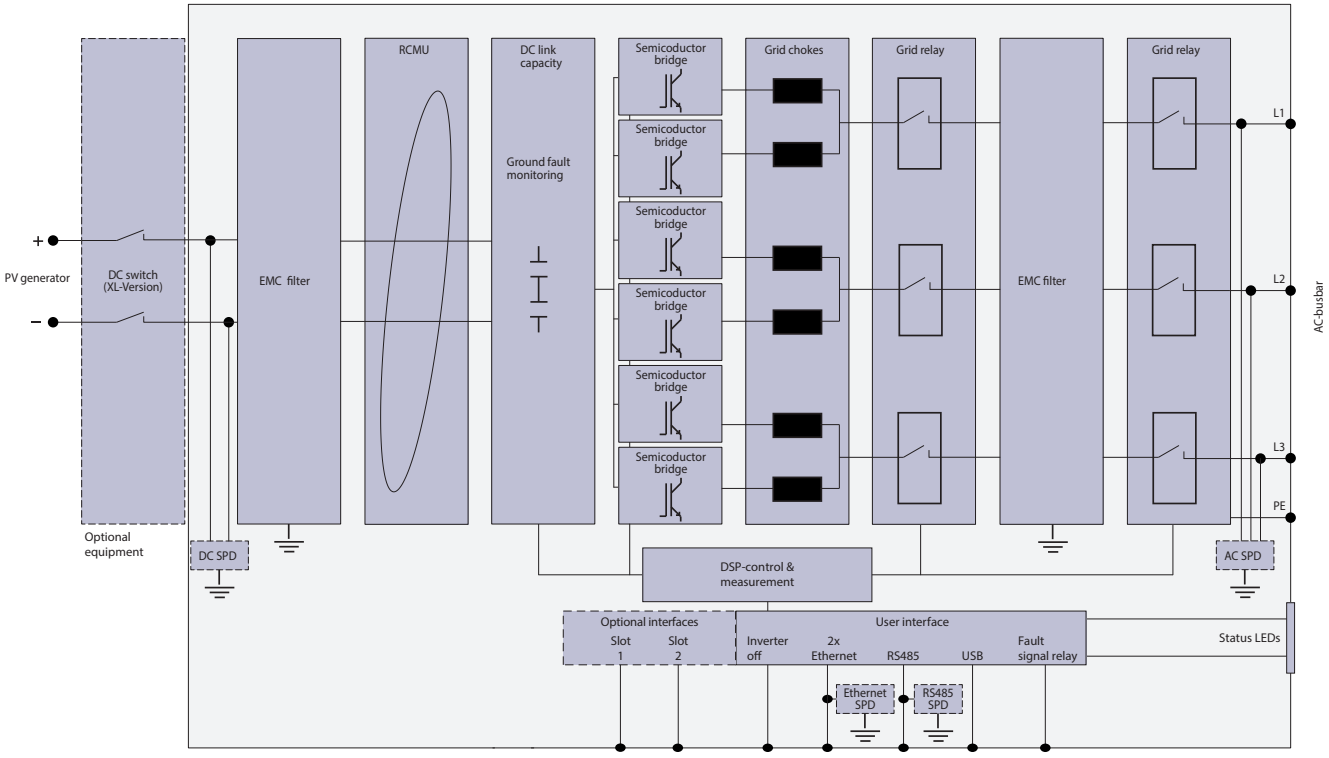



*Fig. 17:* Block schema blueplanet 87.0-165 TL3

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% de In]** | **[A]** | **[% de In]** |
| 1 | 130,917 | 98,95 | 130,945 | 98,98 |
| 2 | 0,285 | 0,22 | 0,237 | 0,18 |
| 3 | 0,099 | 0,07 | 0,093 | 0,07 |
| 4 | 0,135 | 0,10 | 0,145 | 0,11 |
| 5 | 0,938 | 0,71 | 1,042 | 0,79 |
| 6 | 0,103 | 0,08 | 0,103 | 0,08 |

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% de In]** | **[A]** | **[% de In]** |
| 7 | 0,681 | 0,51 | 0,693 | 0,52 |
| 8 | 0,076 | 0,06 | 0,076 | 0,06 |
| 9 | 0,035 | 0,03 | 0,037 | 0,03 |
| 10 | 0,070 | 0,05 | 0,068 | 0,05 |
| 11 | 0,320 | 0,24 | 0,339 | 0,26 |
| 12 | 0,107 | 0,08 | 0,106 | 0,08 |
| 13 | 0,241 | 0,18 | 0,297 | 0,22 |
| 14 | 0,089 | 0,07 | 0,095 | 0,07 |
| 15 | 0,039 | 0,03 | 0,034 | 0,03 |
| 16 | 0,072 | 0,05 | 0,075 | 0,06 |
| 17 | 0,233 | 0,18 | 0,290 | 0,22 |
| 18 | 0,117 | 0,09 | 0,111 | 0,08 |
| 19 | 0,219 | 0,17 | 0,266 | 0,20 |
| 20 | 0,095 | 0,07 | 0,097 | 0,07 |
| 21 | 0,041 | 0,03 | 0,039 | 0,03 |
| 22 | 0,082 | 0,06 | 0,085 | 0,06 |
| 23 | 0,198 | 0,15 | 0,244 | 0,18 |
| 24 | 0,099 | 0,07 | 0,105 | 0,08 |
| 25 | 0,177 | 0,13 | 0,213 | 0,16 |
| 26 | 0,097 | 0,07 | 0,095 | 0,07 |
| 27 | 0,050 | 0,04 | 0,039 | 0,03 |
| 28 | 0,078 | 0,06 | 0,083 | 0,06 |
| 29 | 0,182 | 0,14 | 0,205 | 0,16 |
| 30 | 0,092 | 0,07 | 0,092 | 0,07 |
| 31 | 0,158 | 0,12 | 0,175 | 0,13 |
| 32 | 0,087 | 0,07 | 0,083 | 0,06 |
| 33 | 0,042 | 0,03 | 0,033 | 0,02 |
| 34 | 0,071 | 0,05 | 0,070 | 0,05 |
| 35 | 0,141 | 0,11 | 0,149 | 0,11 |
| 36 | 0,075 | 0,06 | 0,072 | 0,05 |
| 37 | 0,124 | 0,09 | 0,127 | 0,10 |
| 38 | 0,077 | 0,06 | 0,067 | 0,05 |
| 39 | 0,034 | 0,03 | 0,027 | 0,02 |
| 40 | 0,062 | 0,05 | 0,057 | 0,04 |
| 41 | 0,117 | 0,09 | 0,113 | 0,09 |
| 42 | 0,064 | 0,05 | 0,059 | 0,04 |
| 43 | 0,097 | 0,07 | 0,092 | 0,07 |
| 44 | 0,063 | 0,05 | 0,055 | 0,04 |
| 45 | 0,029 | 0,02 | 0,021 | 0,02 |
| 46 | 0,054 | 0,04 | 0,046 | 0,03 |
| 47 | 0,086 | 0,06 | 0,079 | 0,06 |
| 48 | 0,053 | 0,04 | 0,047 | 0,04 |
| 49 | 0,067 | 0,05 | 0,063 | 0,05 |
| 50 | 0,053 | 0,04 | 0,044 | 0,03 |

*Tab. 6:* Harmonics 50 Hz and 60 Hz

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## Deratingverhalten

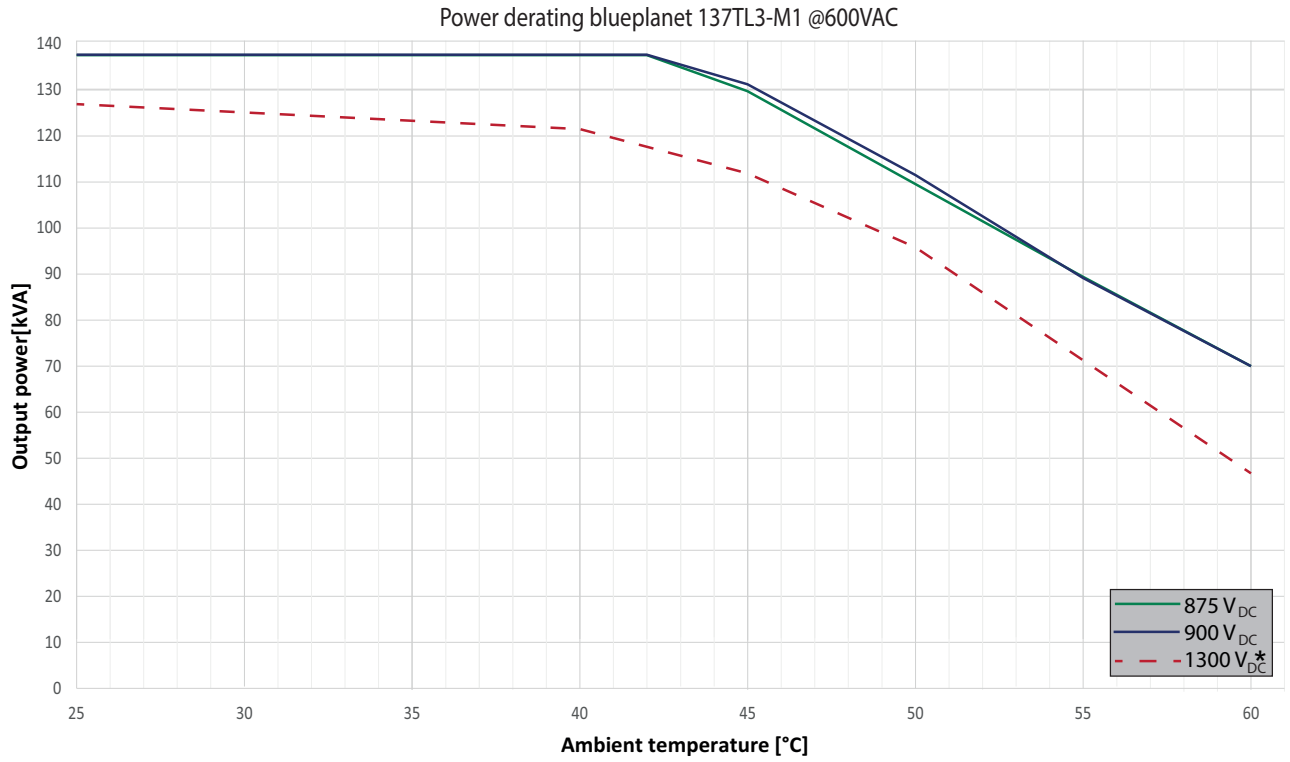



*Fig. 18:* Power derating blueplanet 137 TL3

**) Due to the thermal characteristics of solar modules an operational DC voltage of 1300VDC is not to be expected at higher ambient temperatures in the vast majority of system designs.*

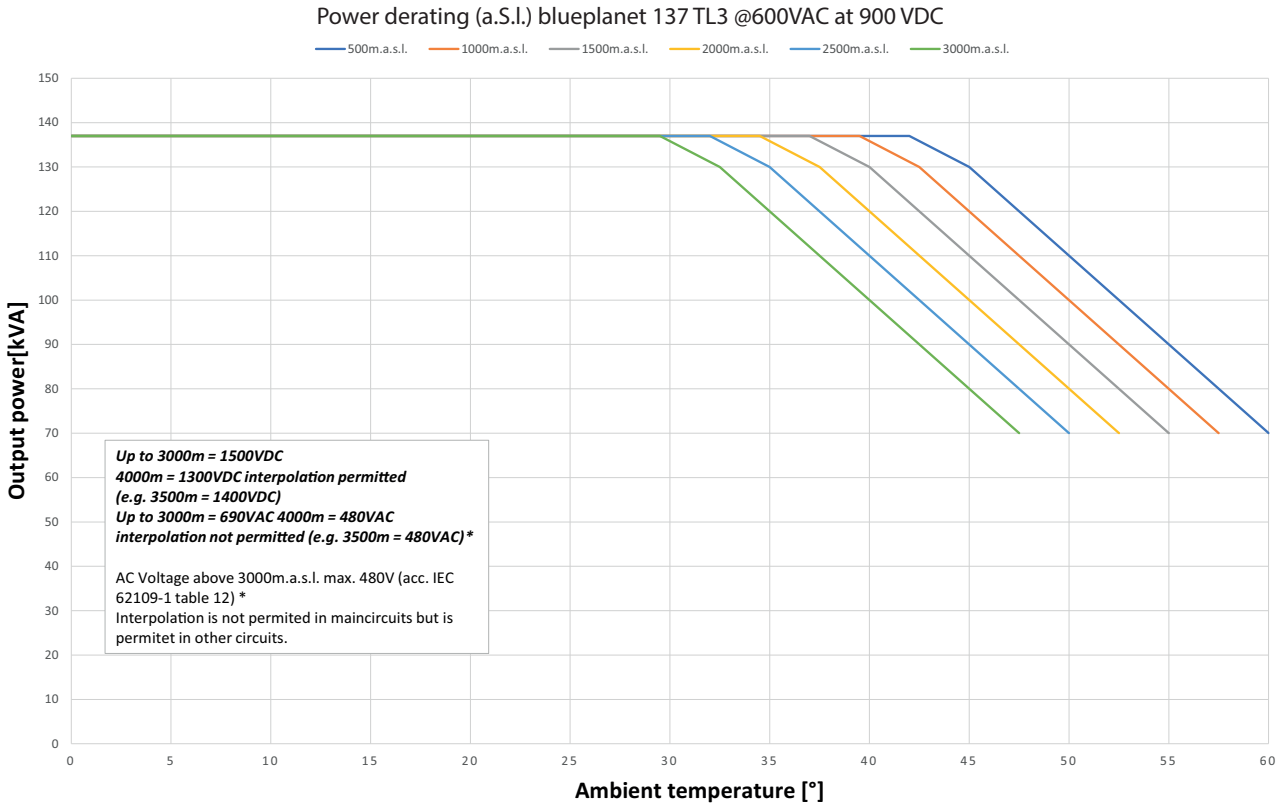



*Fig. 19:* Power reduction in relation to the height above sea level blueplanet 137 TL3

**) The provided values are simulation results and may vary from actual performance data under real operating conditions.*

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## Efficiency characteristic

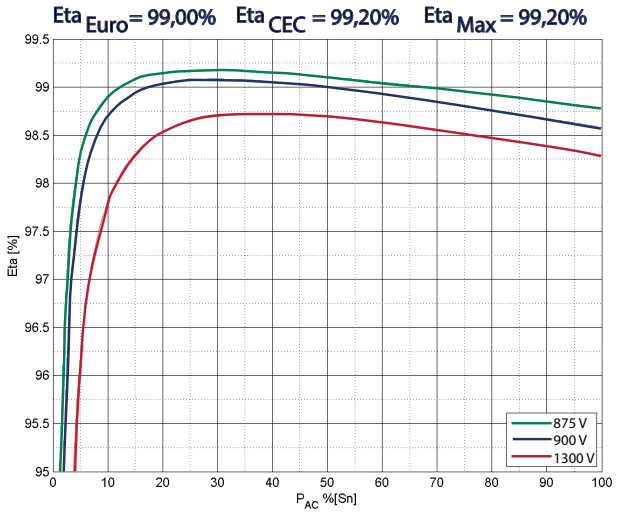



*Fig. 20:* 2D Diagram blueplanet 137 TL3

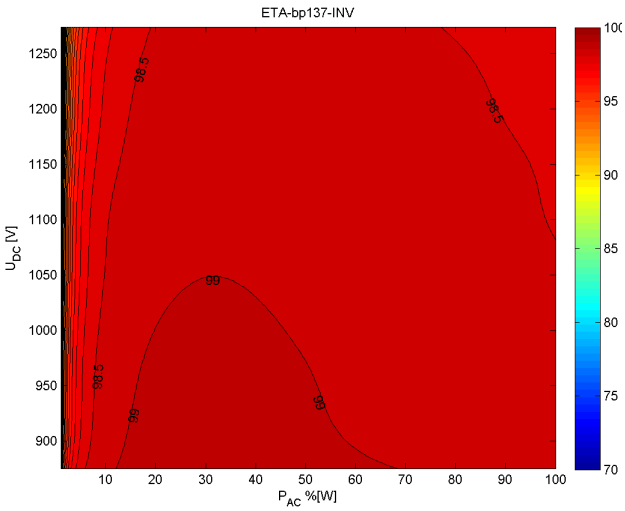



*Fig. 21:* 3D Diagram blueplanet 137 TL3

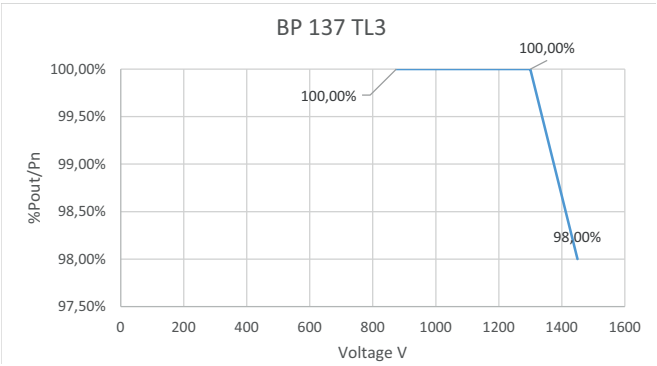



*Fig. 22:* 2D Diagram %Pout/Pn vs Voltage 137 TL3

## P-Q Diagram depanding on operating voltage

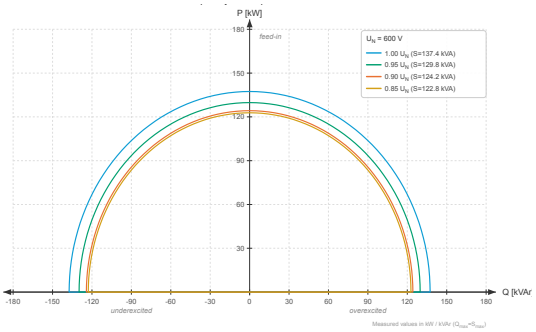



*Fig. 23:* P-Q operating range for bp 137 TL3 ($Q_{max}$=$S_{max}$)

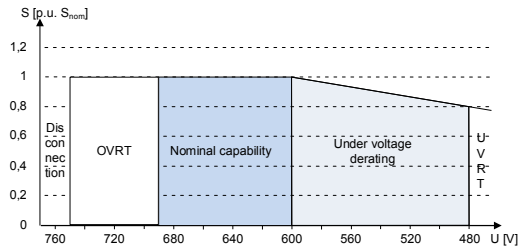



*Fig. 24:* Apparent power subject to the grid voltage for bp 137 TL3

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## 1.4 KACO blueplanet 150 TL3 GEN2

| AC-Power | | | | |
|---|---|---|---|---|
| Inverter power nominal | 150 kVA | | | |
| Inverter power maximal | 150 kVA | | | |
| Rated current (In) | 3 x 131.2 A | | | |
| Contribution to continuous short-circuit current (max. output fault current) | 132.3 A | | | |
| Power electronics type | IGBT-MLI (self-commutated) | | | |
| Rated operating voltage | 660 V | | | |
| cos phi nominal | ≈ 1 | | | |
| Grid connection | Three-phase | | | |
| Impedance at 165 Hz * | R175 Hz ≈ 47,0 Ω, X175 Hz ≈ 360,0 Ω | | | |
| Impedance at 175 Hz * | R165 Hz ≈ 360,0 Ω, X165 Hz ≈ 100,0 Ω | | | |
| * Scheme in parallel | | | | |

| Operating behaviour in the event of a short circuit at the inverter output | |
|---|---|
| Contribution to peak short-circuit current (îp) | 212 A |
| Contribution to initial short-circuit AC current (Ik'' first single-period RMS value) | 137 A |

| Power quality characteristics | | | | |
|---|---|---|---|---|
| Max. number of switching operations, $N_{10}$ | 10 | | | |
| Max. number of switching operations, $N_{120}$ | 120 | | | |
| Case of switching operation | Cut-in at 10 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,05 | 0,03 | 0,05 | 0,05 |
| Voltage change factor | 2,05 | 2,05 | 2,05 | 2,05 |
| Maximum incrush current factor | 1,00 | | | |
| Maximum incrush current factor (transient only) | 0,02 | | | |
| Case of switching operation | Cut-in at 100 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,33 | 0,47 | 0,30 | 0,29 |
| Voltage change factor | 2,05 | 2,05 | 2,05 | 2,05 |
| Maximum inrush current factor | 0,51 | | | |
| Maximum inrush current factor (transient only) | 0,02 | | | |
| Case of switching operation | Service disconnection at rated power | | | |
| Description of the service disconnection procedure | Disconnection by the DC-switch | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,80 | 0,60 | 0,33 | 0,12 |
| Voltage change factor | 2,05 | 2,05 | 2,05 | 2,05 |
| Maximum inrush current factor | 0,08 | | | |
| Maximum inrush current factor (transient only) | 0,04 | | | |
| Worst case over all switching operations | 1,00 | | | |

| | |
|---|---|
| Worst case over all switching operations (transient only) | 0,04 |
| Note: $S_{k, fic}/S_n$ in the fictitious grid was set to | 20 |

| Flicker | | | | |
|---|---|---|---|---|
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,96 | 0,94 | 0,92 | 0,92 |
| Short term flicker | 0,048 | 0,047 | 0,046 | 0,046 |
| Note: $S_{k, fic}/S_n$ in the fictitious grid was set to | 20 | | | |

| Injection of DC currents |
|---|
| The inverter has a direct current injection lower than 0,16%, in addition the inverter has a dc current monitoring and trips in case of dc current greater than 1 A in less than 200ms |

| EUT Operative condition | | $I_{dc}$ threshold [mA] | $I_{dc}$ simulated [mA] | Trip time [ma] | Ibcomp L1 [%] | Ibcomp L2 [%] | Ibcomp L3 [%] |
|---|---|---|---|---|---|---|---|
| OC1 | 33 % Pn | 1000 | >1000 | 200 | 0,156 | 0,213 | 0,068 |
| OC2 | 66% Pn | | | | -0,063 | -0,081 | -0,066 |
| OC3 | 100 % Pn | | | | -0,107 | -0,147 | -0,016 |
| % rated AC current | | | | | 0,12 | 0,16 | 0,05 |

*Tab. 7:* DC-Injection measurement values (bp 125 TL3)

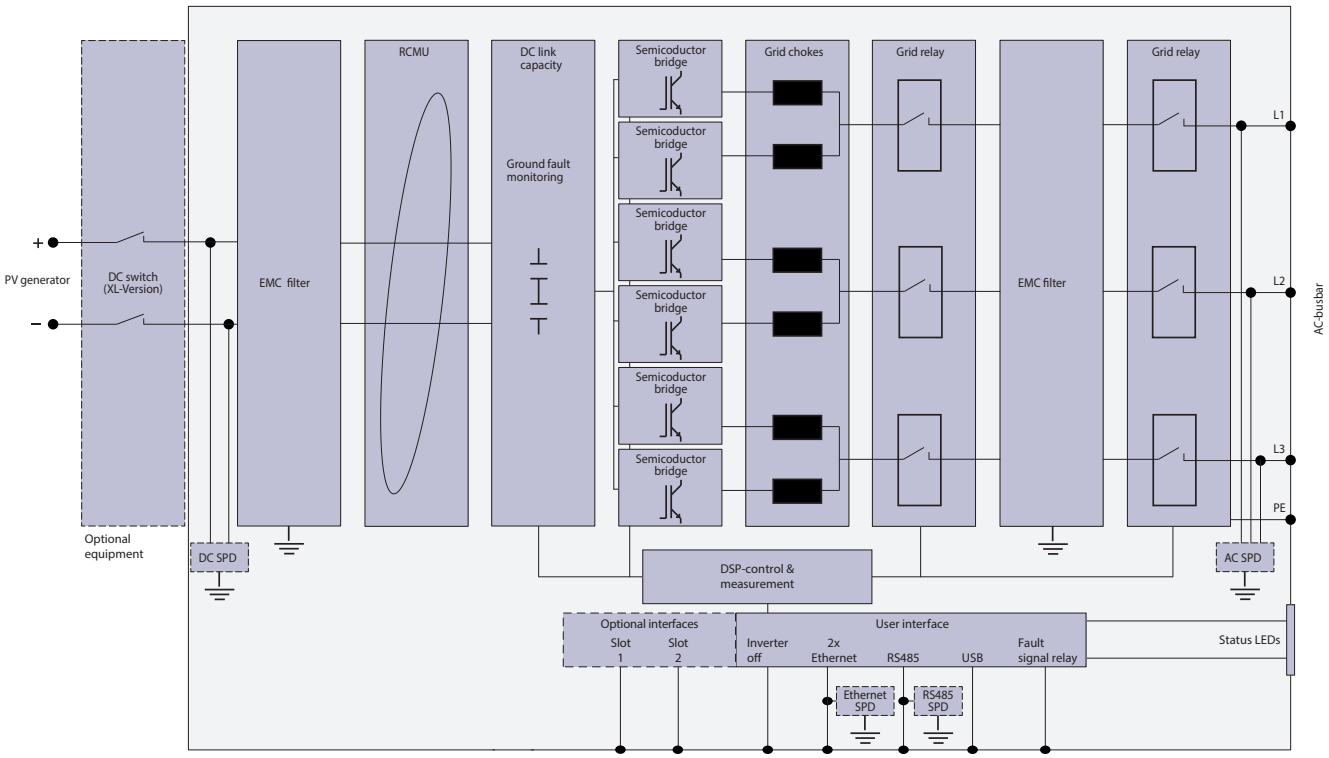



*Fig. 25:* Block schema blueplanet 87.0-165 TL3

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% de In]** | **[A]** | **[% de In]** |
| 1 | 126,717 | 95,85 | 127,616 | 96,46 |
| 2 | 0,088 | 0,18 | 0,233 | 0,18 |
| 3 | 0,143 | 0,11 | 0,122 | 0,09 |
| 4 | 0,038 | 0,11 | 0,139 | 0,11 |
| 5 | 0,356 | 0,64 | 0,663 | 0,69 |
| 6 | 0,043 | 0,10 | 0,124 | 0,10 |

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| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% de In]** | **[A]** | **[% de In]** |
| 7 | 0,374 | 0,53 | 0,259 | 0,54 |
| 8 | 0,062 | 0,07 | 0,082 | 0,07 |
| 9 | 0,035 | 0,05 | 0,041 | 0,04 |
| 10 | 0,059 | 0,09 | 0,095 | 0,08 |
| 11 | 0,244 | 0,38 | 0,660 | 0,50 |
| 12 | 0,074 | 0,10 | 0,097 | 0,10 |
| 13 | 0,272 | 0,21 | 0,240 | 0,23 |
| 14 | 0,058 | 0,08 | 0,085 | 0,07 |
| 15 | 0,031 | 0,06 | 0,043 | 0,05 |
| 16 | 0,058 | 0,06 | 0,068 | 0,06 |
| 17 | 0,258 | 0,31 | 0,500 | 0,38 |
| 18 | 0,090 | 0,09 | 0,075 | 0,10 |
| 19 | 0,230 | 0,17 | 0,131 | 0,18 |
| 20 | 0,070 | 0,08 | 0,073 | 0,07 |
| 21 | 0,031 | 0,05 | 0,059 | 0,05 |
| 22 | 0,066 | 0,06 | 0,079 | 0,06 |
| 23 | 0,228 | 0,21 | 0,312 | 0,24 |
| 24 | 0,102 | 0,09 | 0,090 | 0,09 |
| 25 | 0,224 | 0,17 | 0,155 | 0,13 |
| 26 | 0,082 | 0,09 | 0,074 | 0,07 |
| 27 | 0,035 | 0,06 | 0,076 | 0,06 |
| 28 | 0,067 | 0,07 | 0,086 | 0,06 |
| 29 | 0,183 | 0,16 | 0,200 | 0,15 |
| 30 | 0,106 | 0,09 | 0,106 | 0,08 |
| 31 | 0,187 | 0,14 | 0,193 | 0,15 |
| 32 | 0,082 | 0,08 | 0,075 | 0,06 |
| 33 | 0,029 | 0,07 | 0,063 | 0,05 |
| 34 | 0,062 | 0,07 | 0,073 | 0,05 |
| 35 | 0,161 | 0,15 | 0,161 | 0,12 |
| 36 | 0,098 | 0,09 | 0,092 | 0,07 |
| 37 | 0,159 | 0,14 | 0,162 | 0,12 |
| 38 | 0,075 | 0,07 | 0,066 | 0,05 |
| 39 | 0,030 | 0,06 | 0,043 | 0,03 |
| 40 | 0,055 | 0,06 | 0,058 | 0,04 |
| 41 | 0,119 | 0,13 | 0,111 | 0,08 |
| 42 | 0,085 | 0,08 | 0,067 | 0,05 |
| 43 | 0,116 | 0,12 | 0,097 | 0,07 |
| 44 | 0,065 | 0,07 | 0,050 | 0,04 |
| 45 | 0,019 | 0,05 | 0,030 | 0,02 |
| 46 | 0,045 | 0,06 | 0,041 | 0,03 |
| 47 | 0,089 | 0,10 | 0,067 | 0,05 |
| 48 | 0,071 | 0,07 | 0,045 | 0,03 |
| 49 | 0,083 | 0,09 | 0,057 | 0,04 |
| 50 | 0,054 | 0,05 | 0,034 | 0,03 |

*Tab. 8:* Harmonics 50 Hz and 60 Hz

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## Deratingverhalten

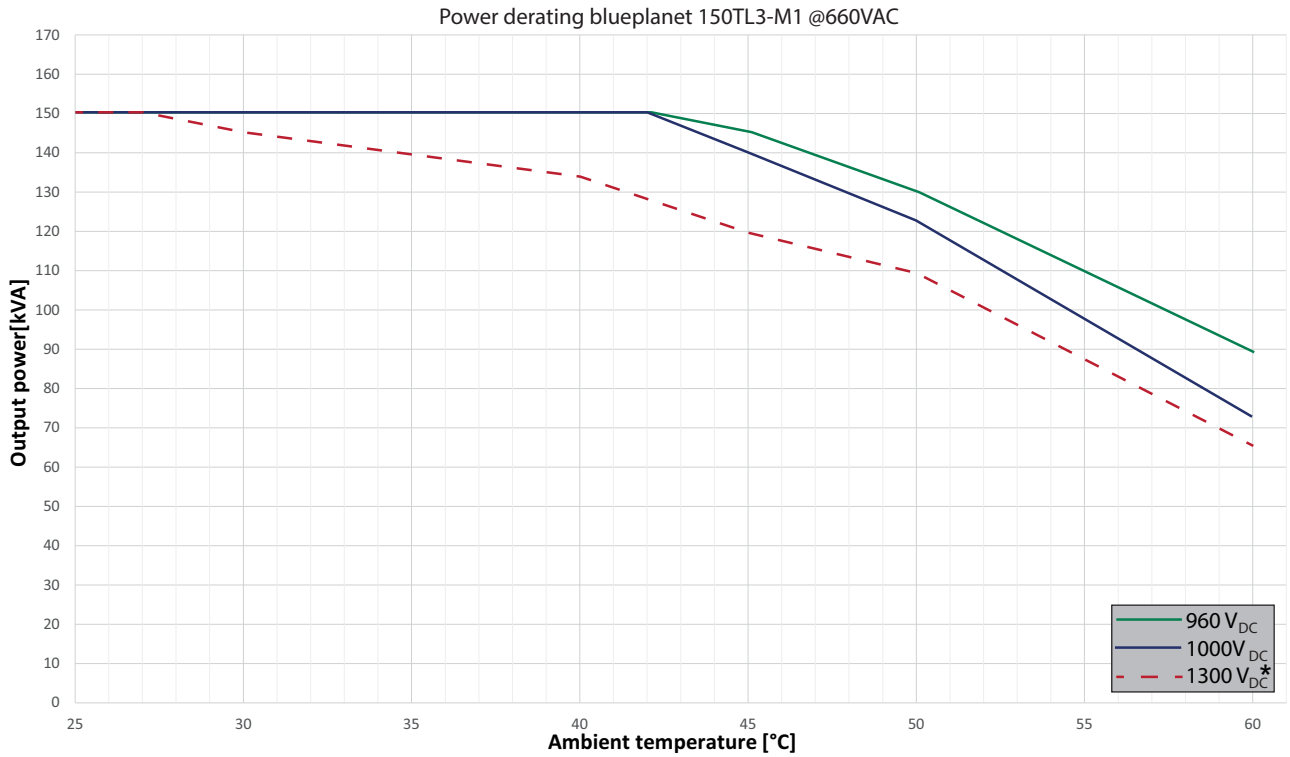



*Fig. 26:* Power derating blueplanet 150 TL3

**) Due to the thermal characteristics of solar modules an operational DC voltage of 1300VDC is not to be expected at higher ambient temperatures in the vast majority of system designs.*

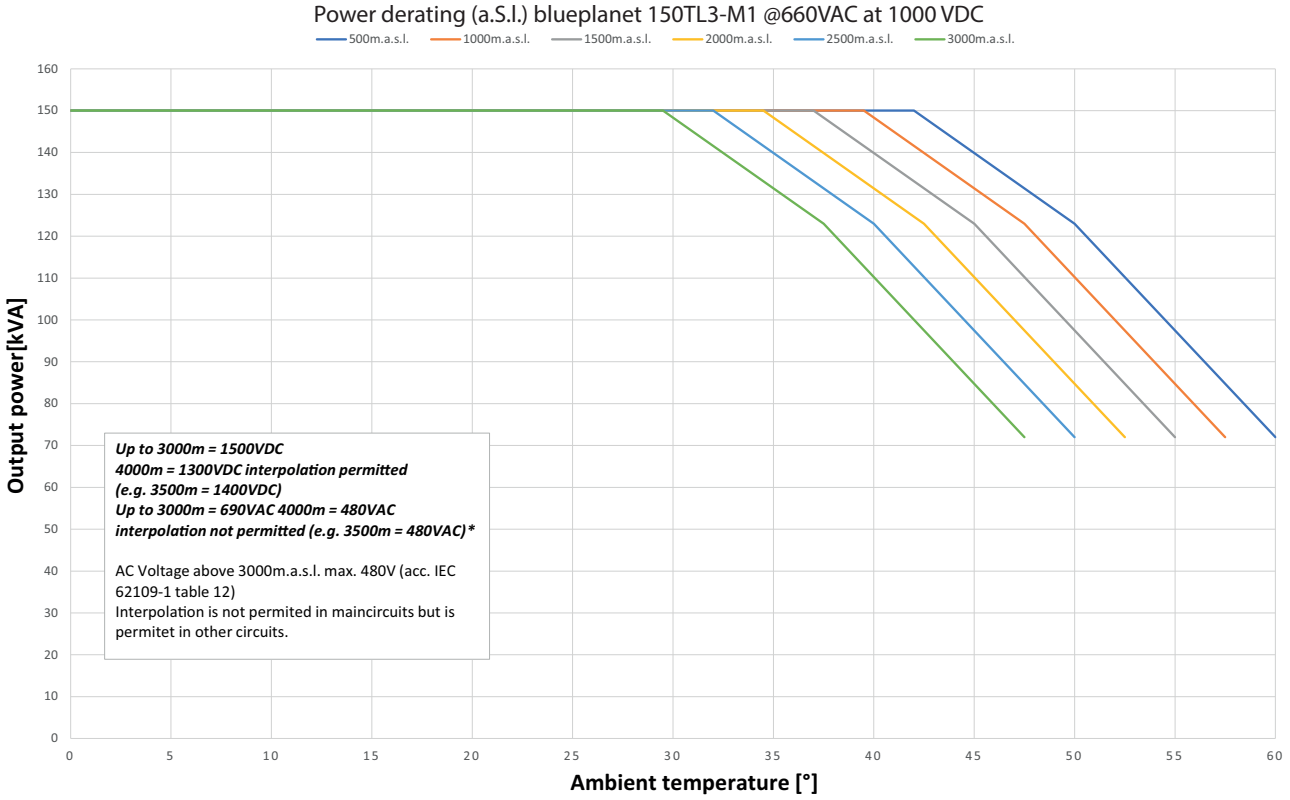



*Fig. 27:* Power reduction in relation to the height above sea level blueplanet 150 TL3

**) The provided values are simulation results and may vary from actual performance data under real operating conditions.*

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## Efficiency characteristic

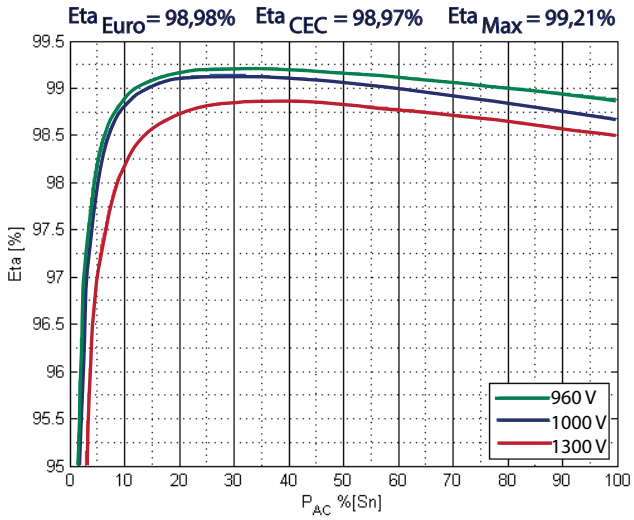



*Fig. 28:* 2D Diagram blueplanet 150 TL3

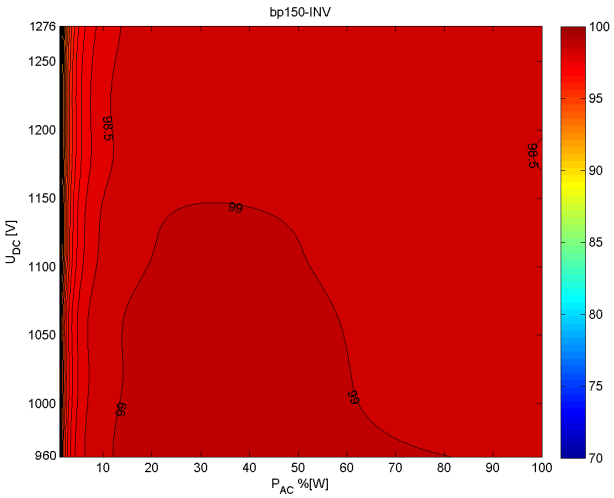



*Fig. 29:* 3D Diagram blueplanet 150 TL3

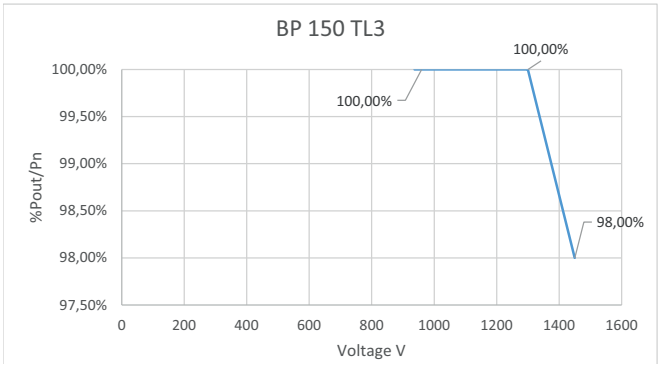



*Fig. 30:* 2D Diagram %Pout/Pn vs Voltage 150 TL3

## P-Q Diagram depanding on operating voltage

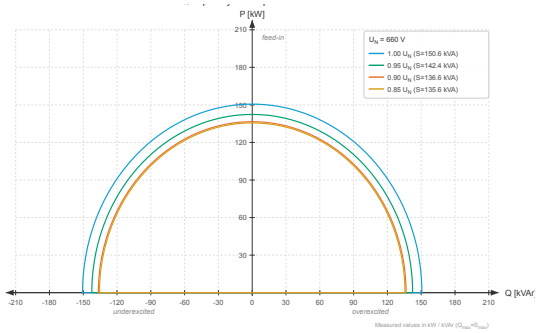



*Fig. 31:* P-Q operating range for bp 150 TL3 ($Q_{max}$=$S_{max}$)

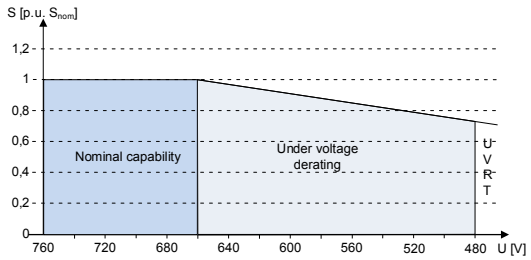



*Fig. 32:* Apparent power subject to the grid voltage for bp 150 TL3

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## 1.5 KACO blueplanet 155 TL3 GEN2

| AC-Power | | | | |
|---|---|---|---|---|
| Inverter power nominal | 155 kVA | | | |
| Inverter power maximal | 155 kVA | | | |
| Rated current (In) | 3 x 149,5 A | | | |
| Contribution to continuous short-circuit current (max. output fault current) | 152 A | | | |
| Power electronics type | IGBT-MLI (self-commutated) | | | |
| Rated operating voltage | 600 V | | | |
| cos phi nominal | ≈ 1 | | | |
| Grid connection | Three-phase | | | |
| Impedance at 165 Hz * | R175 Hz ≈ 47,0 Ω, X175 Hz ≈ 360,0 Ω | | | |
| Impedance at 175 Hz * | R165 Hz ≈ 360,0 Ω, X165 Hz ≈ 100,0 Ω | | | |
| * Scheme in parallel | | | | |

| Operating behaviour in the event of a short circuit at the inverter output | |
|---|---|
| Contribution to peak short-circuit current (îp) | 260.8 A |
| Contribution to initial short-circuit AC current (Ik'' first single-period RMS value) | 157 A |

| Power quality characteristics | | | | |
|---|---|---|---|---|
| Max. number of switching operations, $N_{10}$ | 10 | | | |
| Max. number of switching operations, $N_{120}$ | 120 | | | |
| Case of switching operation | Cut-in at 10 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,0217 | 0,0313 | 0,0380 | 0,0400 |
| Voltage change factor | 0,0046 | 0,0046 | 0,0046 | 0,0046 |
| Maximum inrush current factor | 0,128 | | | |
| Maximum inrush current factor (transient only) | 0,020 | | | |
| Case of switching operation | Cut-in at 100 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,0632 | 0,0637 | 0,0739 | 0,0760 |
| Voltage change factor | 0,0404 | 0,0404 | 0,0404 | 0,0404 |
| Maximum inrush current factor | 0,391 | | | |
| Maximum inrush current factor (transient only) | 0,020 | | | |
| Case of switching operation | Service disconnection at rated power | | | |
| Description of the service disconnection procedure | Disconnection by the DC-switch | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,0199 | 0,0276 | 0,0323 | 0,0332 |
| Voltage change factor | 0,0727 | 0,0727 | 0,0727 | 0,0727 |
| Maximum inrush current factor | 0,000 | | | |
| Maximum inrush current factor (transient only) | 0,000 | | | |
| Worst case over all switching operations | 0,033 | | | |
| Worst case over all switching operations (transient only) | 0,040 | | | |

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| | |
|---|---|
| Note: $S_{k,fic}/S_n$ in the fictitious grid was set to | 20 |

| Flicker | | | | |
|---|---|---|---|---|
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,47 | 0,70 | 0,85 | 0,89 |
| Short term flicker | 0,17 | 0,25 | 0,31 | 0,32 |
| Note: $S_{k,fic}/S_n$ in the fictitious grid was set to | 20 | | | |

| Injection of DC currents |
|---|
| The inverter has a direct current injection lower than 0,16%, in addition the inverter has a dc current monitoring and trips in case of dc current greater than 1 A in less than 200ms |

| EUT Operative condition | | $I_{dc}$ threshold [mA] | $I_{dc}$ simulated [mA] | Trip time [ma] | Ibcomp L1 [%] | Ibcomp L2 [%] | Ibcomp L3 [%] |
|---|---|---|---|---|---|---|---|
| OC1 | 33 % Pn | 1000 | >1000 | 200 | 0,156 | 0,213 | 0,068 |
| OC2 | 66% Pn | | | | -0,063 | -0,081 | -0,066 |
| OC3 | 100 % Pn | | | | -0,107 | -0,147 | -0,016 |
| % rated AC current | | | | | 0,12 | 0,12 | 0,16 |

*Tab. 9:* DC-Injection measurement values (bp 165 TL3)

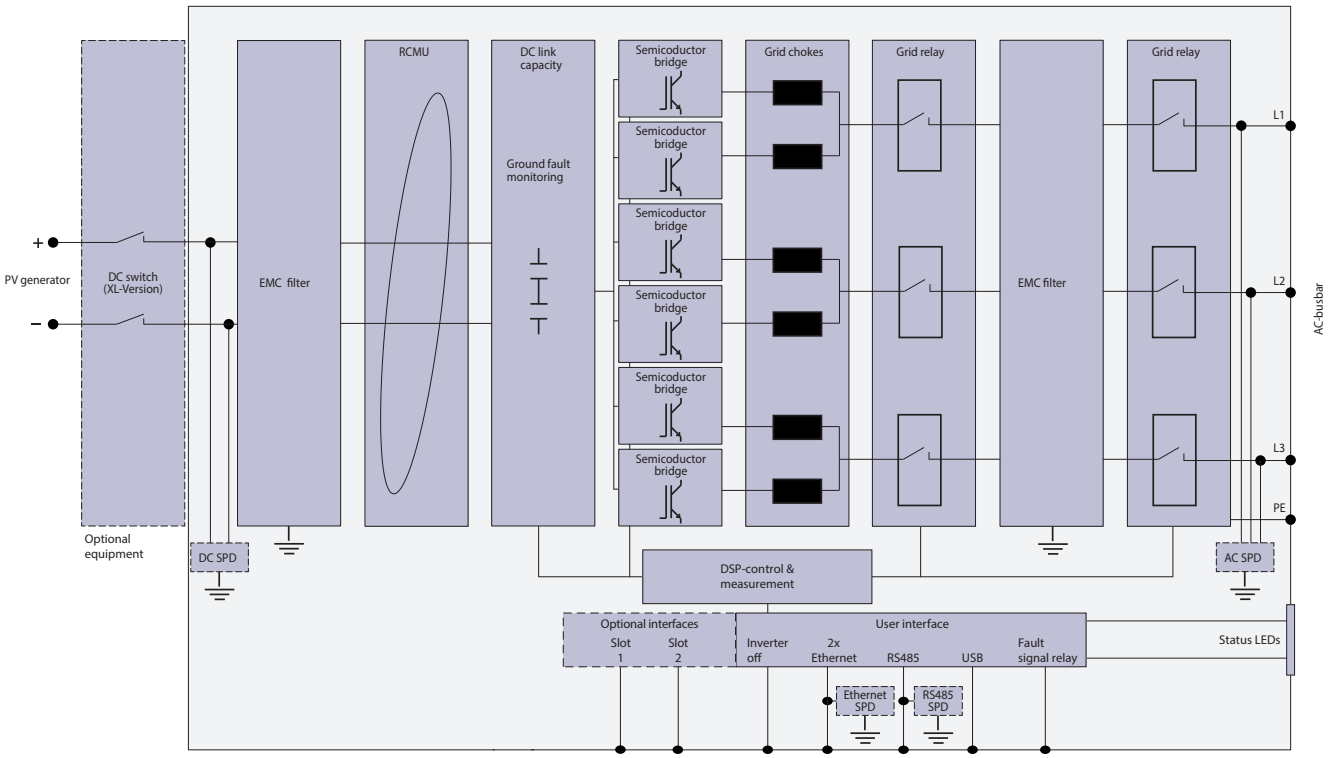



*Fig. 33:* Block schema blueplanet 87.0-165 TL3

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% In]** | **[A]** | **[% In]** |
| 1 | 133,951 | 88,13 | 146,882 | 97,99 |
| 2 | 0,217 | 0,14 | 0,136 | 0,09 |
| 3 | 0,102 | 0,07 | 0,154 | 0,10 |
| 4 | 0,165 | 0,11 | 0,164 | 0,11 |
| 5 | 0,990 | 0,65 | 0,679 | 0,45 |
| 6 | 0,140 | 0,09 | 0,180 | 0,12 |
| 7 | 0,689 | 0,45 | 0,783 | 0,52 |
| 8 | 0,101 | 0,07 | 0,150 | 0,10 |

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% In]** | **[A]** | **[% In]** |
| 9 | 0,092 | 0,06 | 0,115 | 0,08 |
| 10 | 0,137 | 0,09 | 0,174 | 0,12 |
| 11 | 0,324 | 0,21 | 0,725 | 0,48 |
| 12 | 0,126 | 0,08 | 0,172 | 0,11 |
| 13 | 0,318 | 0,21 | 0,470 | 0,31 |
| 14 | 0,086 | 0,06 | 0,143 | 0,10 |
| 15 | 0,095 | 0,06 | 0,130 | 0,09 |
| 16 | 0,162 | 0,11 | 0,158 | 0,11 |
| 17 | 0,289 | 0,19 | 0,415 | 0,28 |
| 18 | 0,129 | 0,09 | 0,148 | 0,10 |
| 19 | 0,263 | 0,17 | 0,403 | 0,27 |
| 20 | 0,081 | 0,05 | 0,123 | 0,08 |
| 21 | 0,082 | 0,05 | 0,119 | 0,08 |
| 22 | 0,143 | 0,09 | 0,111 | 0,07 |
| 23 | 0,254 | 0,17 | 0,382 | 0,25 |
| 24 | 0,134 | 0,09 | 0,114 | 0,08 |
| 25 | 0,230 | 0,15 | 0,410 | 0,27 |
| 26 | 0,074 | 0,05 | 0,083 | 0,06 |
| 27 | 0,080 | 0,05 | 0,095 | 0,06 |
| 28 | 0,123 | 0,08 | 0,112 | 0,07 |
| 29 | 0,207 | 0,14 | 0,319 | 0,21 |
| 30 | 0,117 | 0,08 | 0,102 | 0,07 |
| 31 | 0,207 | 0,14 | 0,304 | 0,20 |
| 32 | 0,075 | 0,05 | 0,088 | 0,06 |
| 33 | 0,067 | 0,04 | 0,089 | 0,06 |
| 34 | 0,094 | 0,06 | 0,108 | 0,07 |
| 35 | 0,180 | 0,12 | 0,256 | 0,17 |
| 36 | 0,106 | 0,07 | 0,091 | 0,06 |
| 37 | 0,185 | 0,12 | 0,197 | 0,13 |
| 38 | 0,070 | 0,05 | 0,068 | 0,05 |
| 39 | 0,047 | 0,03 | 0,064 | 0,04 |
| 40 | 0,063 | 0,04 | 0,075 | 0,05 |
| 41 | 0,150 | 0,10 | 0,168 | 0,11 |
| 42 | 0,102 | 0,07 | 0,059 | 0,04 |
| 43 | 0,147 | 0,10 | 0,140 | 0,09 |
| 44 | 0,067 | 0,04 | 0,055 | 0,04 |
| 45 | 0,034 | 0,02 | 0,048 | 0,03 |
| 46 | 0,057 | 0,04 | 0,047 | 0,03 |
| 47 | 0,126 | 0,08 | 0,114 | 0,08 |
| 48 | 0,095 | 0,06 | 0,045 | 0,03 |
| 49 | 0,114 | 0,08 | 0,091 | 0,06 |
| 50 | 0,065 | 0,04 | 0,043 | 0,03 |

*Tab. 10:* Harmonics 50 Hz and 60 Hz

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## Deratingverhalten

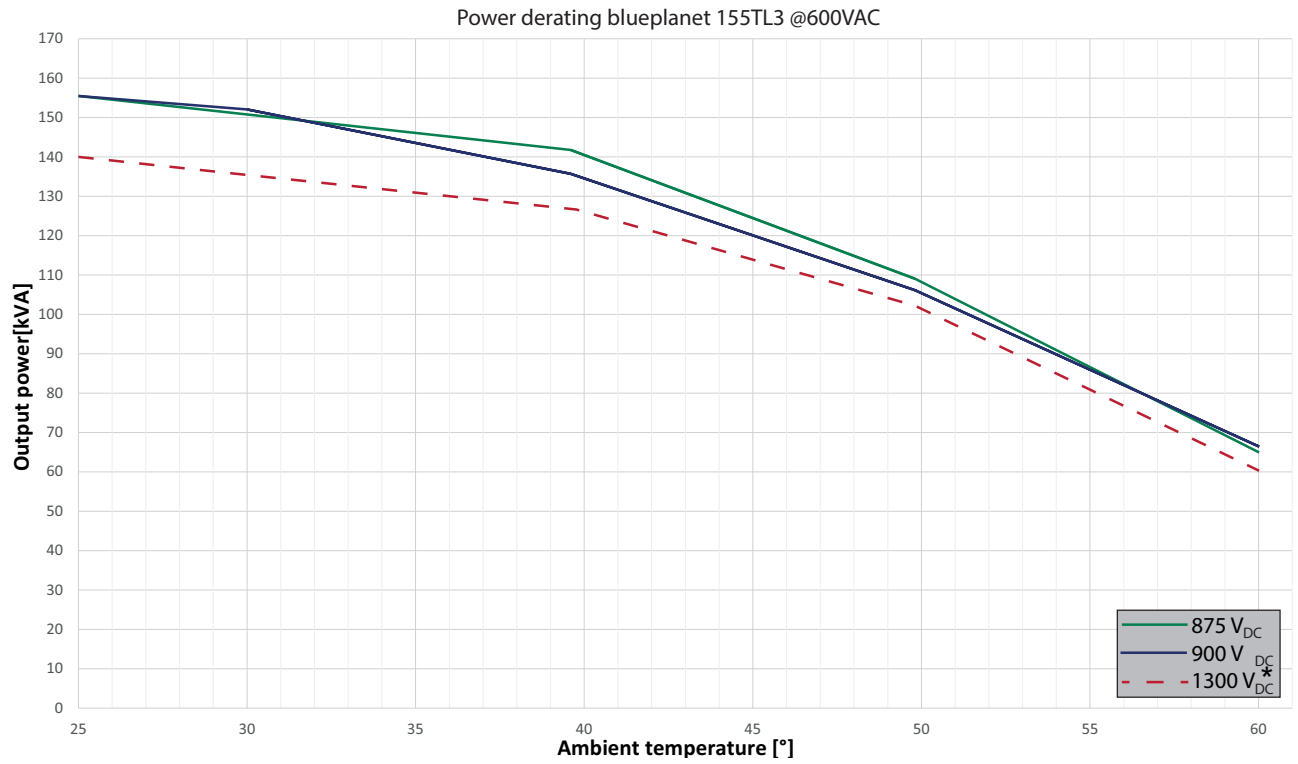



*Fig. 34:* Power derating blueplanet 155 TL3

**) Due to the thermal characteristics of solar modules an operational DC voltage of 1300VDC is not to be expected at higher ambient temperatures in the vast majority of system designs.*

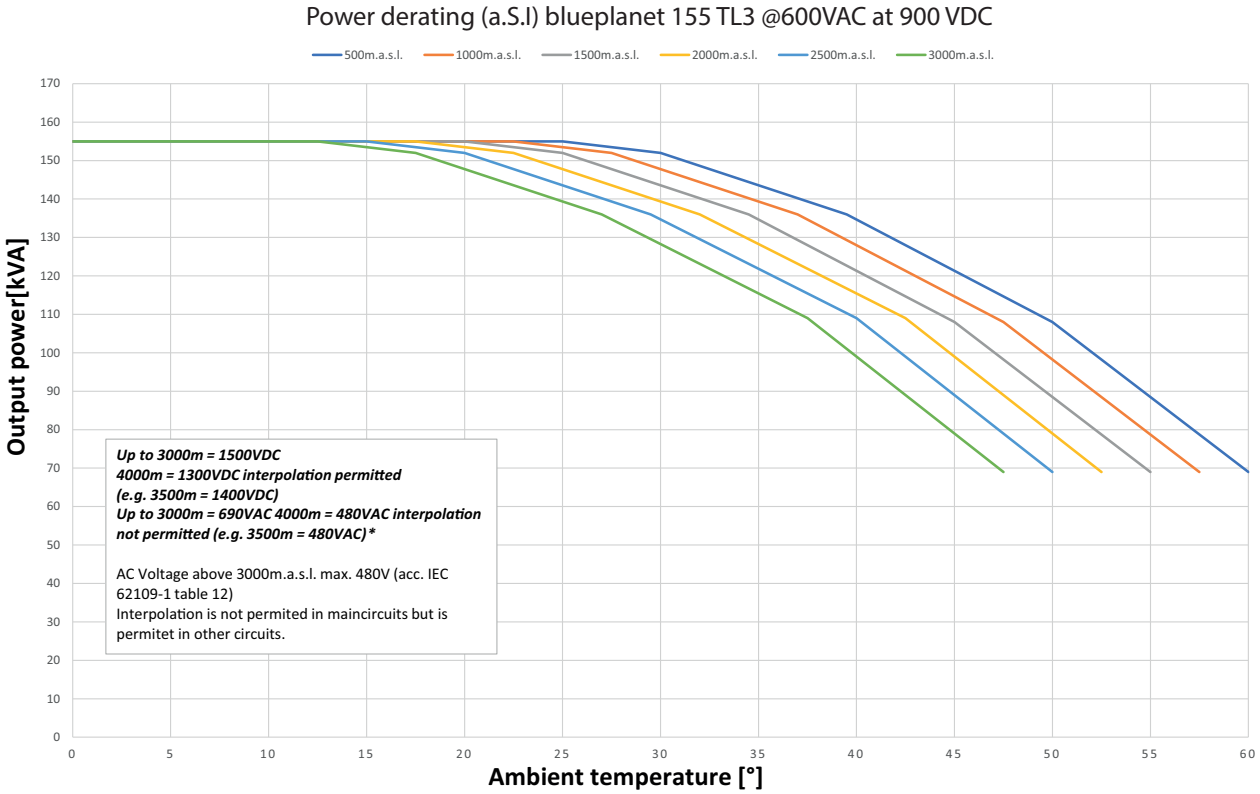



*Fig. 35:* Power reduction in relation to the height above sea level blueplanet 155 TL3

**) The provided values are simulation results and may vary from actual performance data under real operating conditions.*

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## Efficiency characteristic

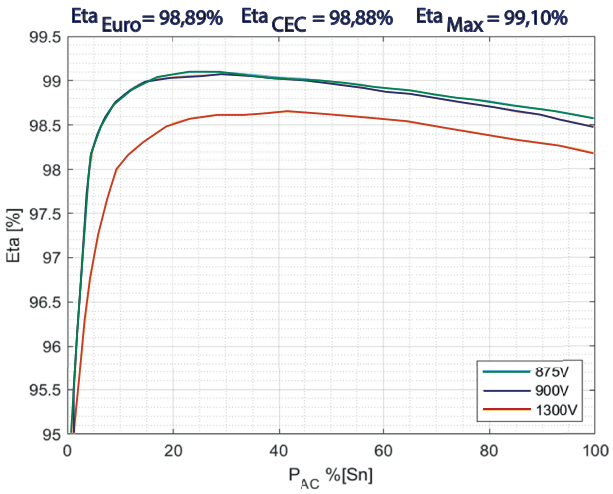



*Fig. 36:* 2D Diagram blueplanet 155TL3

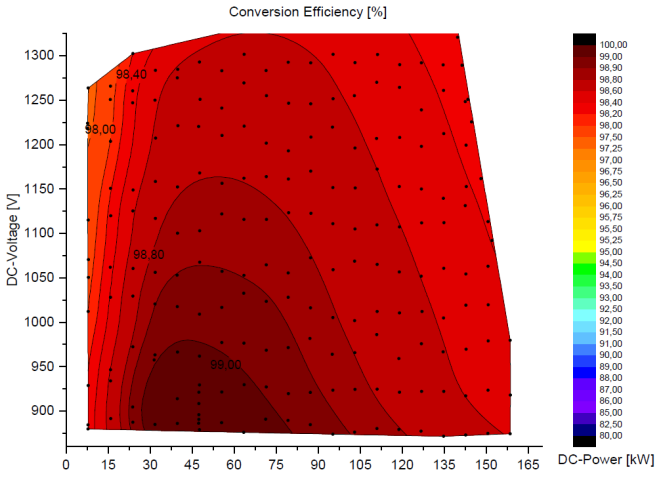



*Fig. 37:* 3D Diagram blueplanet 155TL3

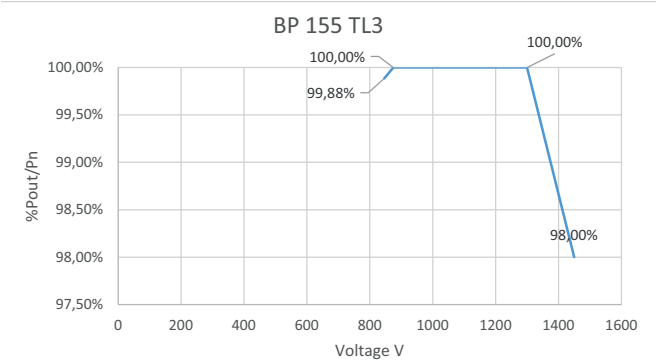



*Fig. 38:* 2D Diagram %Pout/Pn vs Voltage 155 TL3

## P-Q Diagram depanding on operating voltage

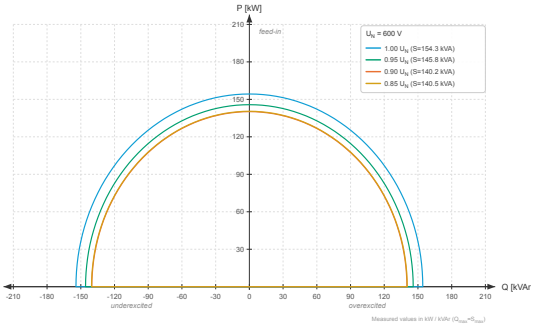



*Fig. 39:* P-Q operating range for bp 155 TL3 ($Q_{max}$=$S_{max}$)

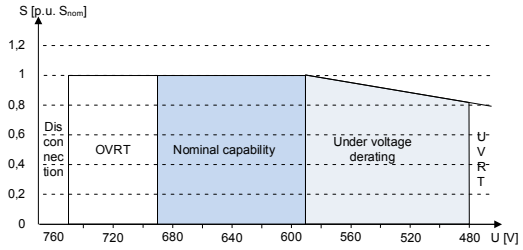



*Fig. 40:* Apparent power subject to the grid voltage for bp 155 TL3

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## 1.6 KACO blueplanet 165 TL3 GEN2

| AC-Power | | | | |
|---|---|---|---|---|
| Inverter power nominal | 165 kVA | | | |
| Inverter power maximal | 165 kVA | | | |
| Rated current (In) | 3 x 144.5 A | | | |
| Contribution to continuous short-circuit current (max. output fault current) | 152 A | | | |
| Power electronics type | IGBT-MLI (self-commutated) | | | |
| Rated operating voltage | 660 V | | | |
| cos phi nominal | ≈ 1 | | | |
| Grid connection | Three-phase | | | |
| Impedance bei 165 Hz * | R175 Hz ≈ 47,0 Ω, X175 Hz ≈ 360,0 Ω | | | |
| Impedance bei 175 Hz * | R165 Hz ≈ 360,0 Ω, X165 Hz ≈ 100,0 Ω | | | |
| * Scheme in parallel | | | | |

| Operating behaviour in the event of a short circuit at the inverter output | |
|---|---|
| Contribution to peak short-circuit current (îp) | 260.8 A |
| Contribution to initial short-circuit AC current (Ik'' first single-period RMS value) | 157 A |

| Power quality characteristics | | | | |
|---|---|---|---|---|
| Max. number of switching operations, $N_{10}$ | 10 | | | |
| Max. number of switching operations, $N_{120}$ | 120 | | | |
| Case of switching operation | Cut-in at 10 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,0197 | 0,0284 | 0,0340 | 0,0357 |
| Voltage change factor | 0,0056 | 0,0056 | 0,0056 | 0,0056 |
| Maximum inrush current factor | 0,120 | | | |
| Maximum inrush current factor (transient only) | 0,020 | | | |
| Case of switching operation | Cut-in at 100 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,0632 | 0,0637 | 0,0739 | 0,0760 |
| Voltage change factor | 0,0404 | 0,0404 | 0,0404 | 0,0404 |
| Maximum inrush current factor | 0,536 | | | |
| Maximum inrush current factor (transient only) | 0,020 | | | |
| Case of switching operation | Service disconnection at rated power | | | |
| Description of the service disconnection procedure | Disconnection by the DC-switch | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,0227 | 0,0319 | 0,0376 | 0,0388 |
| Voltage change factor | 0,0758 | 0,0758 | 0,0758 | 0,0758 |
| Maximum inrush current factor | 0,000 | | | |
| Maximum inrush current factor (transient only) | 0,000 | | | |
| Worst case over all switching operations | 0,038 | | | |
| Worst case over all switching operations (transient only) | 0,040 | | | |

| | |
|---|---|
| Note: $S_{k,fic}/S_n$ in the fictitious grid was set to | 20 |

| Flicker | | | | |
|---|---|---|---|---|
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,47 | 0,69 | 0,83 | 0,87 |
| Short term flicker | 0,15 | 0,22 | 0,26 | 0,28 |
| Note: $S_{k,fic}/S_n$ in the fictitious grid was set to | 20 | | | |

| Injection of DC currents |
|---|
| The inverter has a direct current injection lower than 0,16%, in addition the inverter has a dc current monitoring and trips in case of dc current greater than 1 A in less than 200ms |

| EUT Operative condition | | $I_{dc}$ threshold [mA] | $I_{dc}$ simulated [mA] | Trip time [ma] | Ibcomp L1 [%] | Ibcomp L2 [%] | Ibcomp L3 [%] |
|---|---|---|---|---|---|---|---|
| OC1 | 33 % Pn | 1000 | >1000 | 200 | 0,156 | 0,213 | 0,068 |
| OC2 | 66% Pn | | | | -0,063 | -0,081 | -0,066 |
| OC3 | 100 % Pn | | | | -0,107 | -0,147 | -0,016 |
| % rated AC current | | | | | 0,12 | 0,12 | 0,16 |

*Tab. 11:* DC-Injection measurement values (bp 165 TL3)

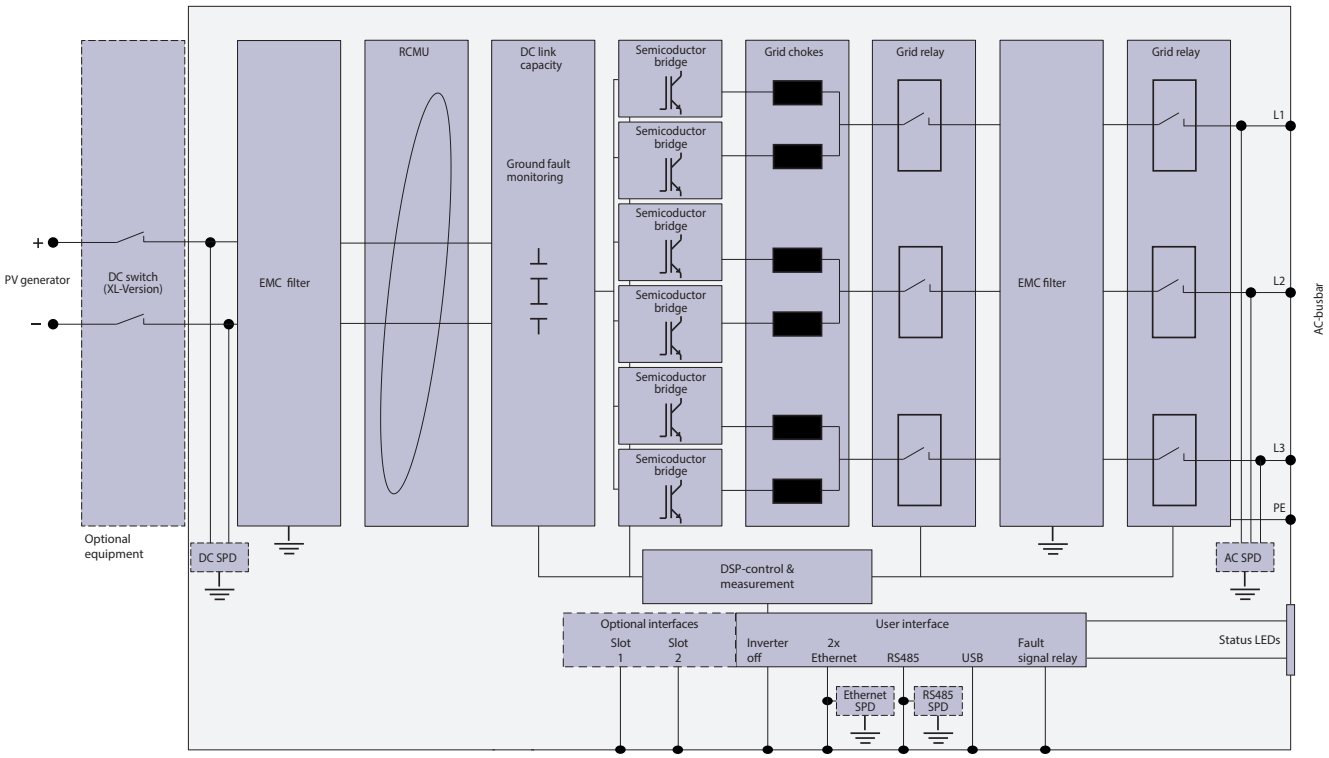



*Fig. 41:* Block schema blueplanet 87.0-165 TL3

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% In]** | **[A]** | **[% In]** |
| 1 | 140,424 | 92,38 | 148,735 | 97,85 |
| 2 | 0,141 | 0,09 | 0,145 | 0,09 |
| 3 | 0,098 | 0,06 | 0,148 | 0,10 |
| 4 | 0,157 | 0,10 | 0,194 | 0,13 |
| 5 | 0,974 | 0,64 | 0,689 | 0,45 |
| 6 | 0,145 | 0,10 | 0,190 | 0,13 |
| 7 | 0,717 | 0,47 | 0,898 | 0,59 |
| 8 | 0,138 | 0,09 | 0,162 | 0,11 |

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| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% In]** | **[A]** | **[% In]** |
| 9 | 0,106 | 0,07 | 0,137 | 0,09 |
| 10 | 0,151 | 0,10 | 0,187 | 0,12 |
| 11 | 0,376 | 0,25 | 0,824 | 0,54 |
| 12 | 0,139 | 0,09 | 0,178 | 0,12 |
| 13 | 0,286 | 0,19 | 0,500 | 0,33 |
| 14 | 0,104 | 0,07 | 0,151 | 0,10 |
| 15 | 0,091 | 0,06 | 0,150 | 0,10 |
| 16 | 0,154 | 0,10 | 0,164 | 0,11 |
| 17 | 0,246 | 0,16 | 0,495 | 0,33 |
| 18 | 0,146 | 0,10 | 0,161 | 0,11 |
| 19 | 0,241 | 0,16 | 0,473 | 0,31 |
| 20 | 0,116 | 0,08 | 0,123 | 0,08 |
| 21 | 0,095 | 0,06 | 0,134 | 0,09 |
| 22 | 0,148 | 0,10 | 0,130 | 0,09 |
| 23 | 0,213 | 0,14 | 0,444 | 0,29 |
| 24 | 0,133 | 0,09 | 0,113 | 0,07 |
| 25 | 0,216 | 0,14 | 0,424 | 0,28 |
| 26 | 0,098 | 0,06 | 0,104 | 0,07 |
| 27 | 0,073 | 0,05 | 0,110 | 0,07 |
| 28 | 0,146 | 0,10 | 0,114 | 0,08 |
| 29 | 0,166 | 0,11 | 0,367 | 0,24 |
| 30 | 0,124 | 0,08 | 0,107 | 0,07 |
| 31 | 0,210 | 0,14 | 0,307 | 0,20 |
| 32 | 0,086 | 0,06 | 0,092 | 0,06 |
| 33 | 0,071 | 0,05 | 0,091 | 0,06 |
| 34 | 0,097 | 0,06 | 0,104 | 0,07 |
| 35 | 0,168 | 0,11 | 0,254 | 0,17 |
| 36 | 0,123 | 0,08 | 0,088 | 0,06 |
| 37 | 0,177 | 0,12 | 0,231 | 0,15 |
| 38 | 0,082 | 0,05 | 0,077 | 0,05 |
| 39 | 0,058 | 0,04 | 0,075 | 0,05 |
| 40 | 0,072 | 0,05 | 0,079 | 0,05 |
| 41 | 0,130 | 0,09 | 0,178 | 0,12 |
| 42 | 0,112 | 0,07 | 0,069 | 0,05 |
| 43 | 0,146 | 0,10 | 0,151 | 0,10 |
| 44 | 0,086 | 0,06 | 0,066 | 0,04 |
| 45 | 0,045 | 0,03 | 0,052 | 0,03 |
| 46 | 0,070 | 0,05 | 0,054 | 0,04 |
| 47 | 0,107 | 0,07 | 0,120 | 0,08 |
| 48 | 0,097 | 0,06 | 0,053 | 0,04 |
| 49 | 0,105 | 0,07 | 0,099 | 0,07 |
| 50 | 0,068 | 0,04 | 0,056 | 0,04 |

*Tab. 12:* Harmonics 50 Hz and 60 Hz

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## Deratingverhalten

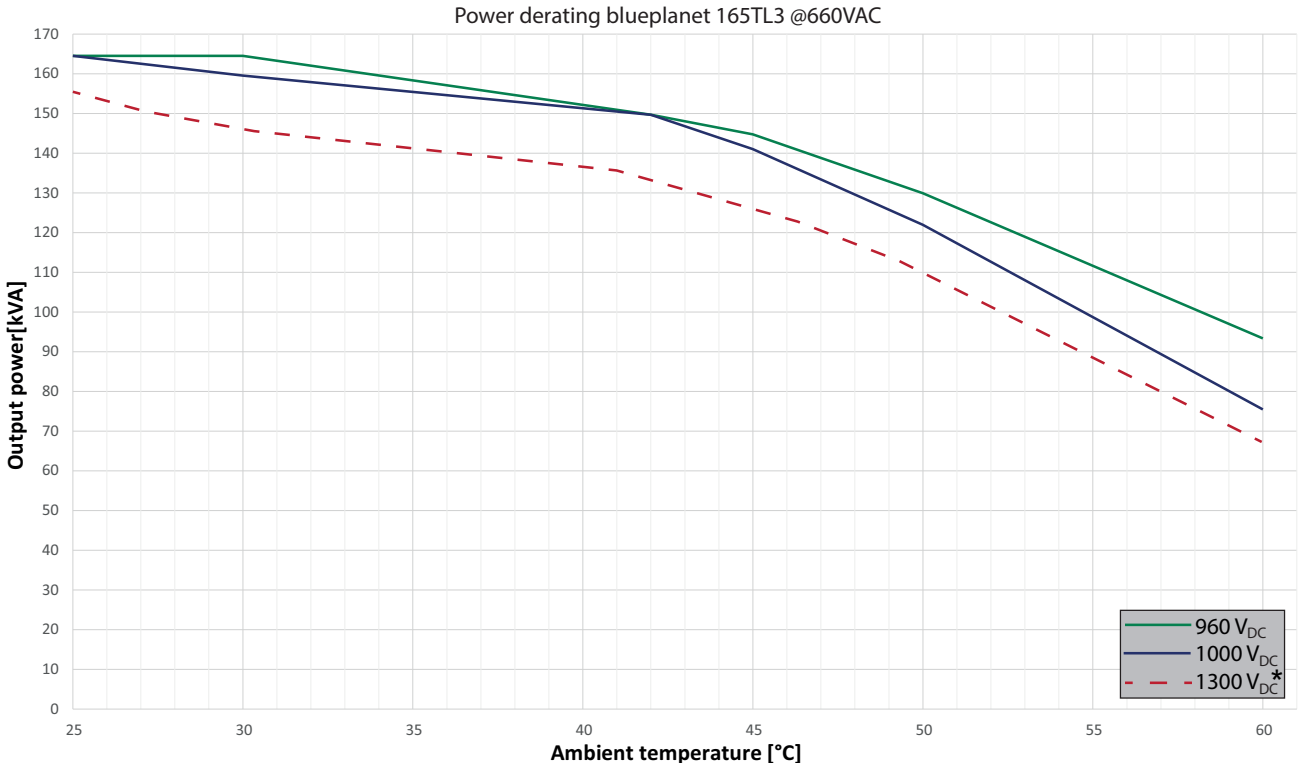



*Fig. 42:* Power derating blueplanet 165 TL3

**) Due to the thermal characteristics of solar modules an operational DC voltage of 1300VDC is not to be expected at higher ambient temperatures in the vast majority of system designs.*

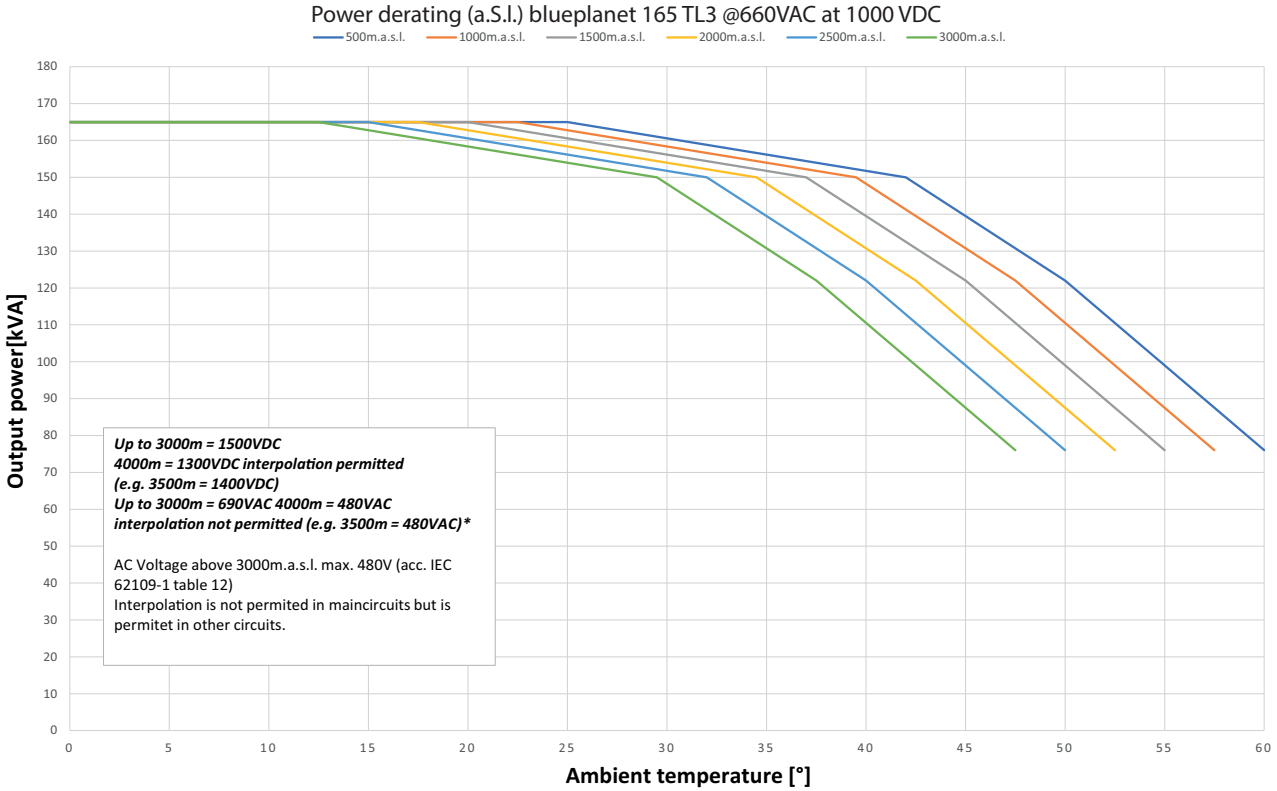



*Fig. 43:* Power reduction in relation to the height above sea level blueplanet 165 TL3

**) The provided values are simulation results and may vary from actual performance data under real operating conditions.*

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## Efficiency characteristic

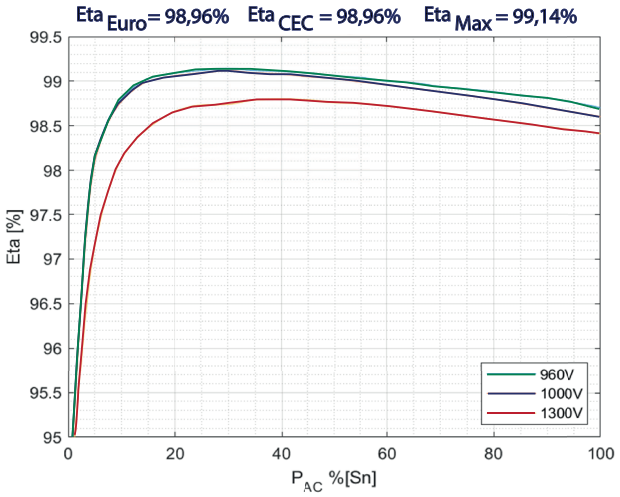



*Fig. 44:* 2D Diagram blueplanet 165TL3

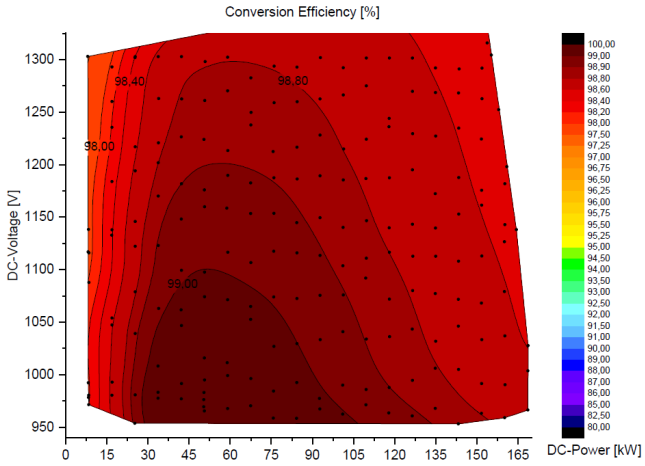



*Fig. 45:* 3D Diagram blueplanet 165TL3

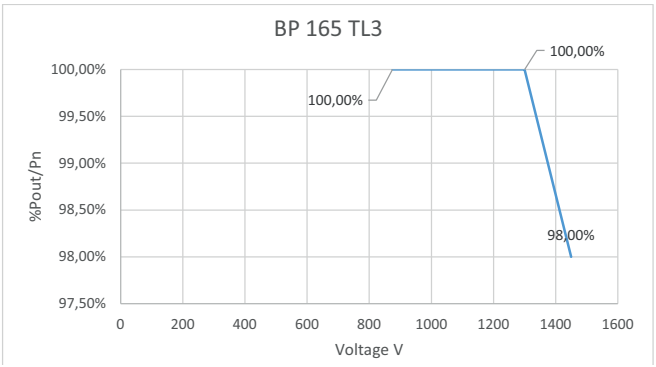



*Fig. 46:* 2D Diagram %Pout/Pn vs Voltage 165 TL3

## P-Q Diagram depanding on operating voltage

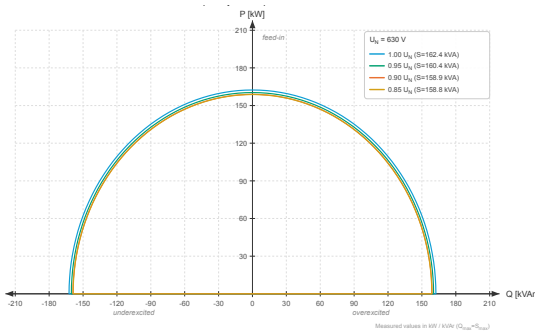



*Fig. 47:* P-Q operating range for bp 165 TL3 ($Q_{max}$=$S_{max}$)

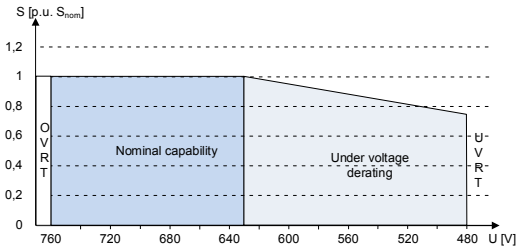



*Fig. 48:* Apparent power subject to the grid voltage for bp 165 TL3

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## 1.7 KACO blueplanet 165 TL3 IT

| AC-Power | | | | |
|---|---|---|---|---|
| Inverter power nominal | 165 kVA | | | |
| Inverter power maximal | 165 kVA | | | |
| Rated current (In) | 3 x 144.5 A | | | |
| Contribution to continuous short-circuit current (max. output fault current) | 152 A | | | |
| Power electronics type | IGBT-MLI (self-commutated) | | | |
| Rated operating voltage | 660 V | | | |
| cos phi nominal | ≈ 1 | | | |
| Grid connection | Three-phase | | | |
| Impedance bei 165 Hz * | R175 Hz ≈ 47,0 Ω, X175 Hz ≈ 360,0 Ω | | | |
| Impedance bei 175 Hz * | R165 Hz ≈ 360,0 Ω, X165 Hz ≈ 100,0 Ω | | | |
| * Scheme in parallel | | | | |

| Operating behaviour in the event of a short circuit at the inverter output | |
|---|---|
| Contribution to peak short-circuit current (îp) | 260.8 A |
| Contribution to initial short-circuit AC current (Ik'' first single-period RMS value) | 157 A |

| Power quality characteristics | | | | |
|---|---|---|---|---|
| Max. number of switching operations, $N_{10}$ | 10 | | | |
| Max. number of switching operations, $N_{120}$ | 120 | | | |
| Case of switching operation | Cut-in at 10 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,0197 | 0,0284 | 0,0340 | 0,0357 |
| Voltage change factor | 0,0056 | 0,0056 | 0,0056 | 0,0056 |
| Maximum inrush current factor | 0,120 | | | |
| Maximum inrush current factor (transient only) | 0,020 | | | |
| Case of switching operation | Cut-in at 100 % of rated power | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,0632 | 0,0637 | 0,0739 | 0,0760 |
| Voltage change factor | 0,0404 | 0,0404 | 0,0404 | 0,0404 |
| Maximum inrush current factor | 0,536 | | | |
| Maximum inrush current factor (transient only) | 0,020 | | | |
| Case of switching operation | Service disconnection at rated power | | | |
| Description of the service disconnection procedure | Disconnection by the DC-switch | | | |
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,0227 | 0,0319 | 0,0376 | 0,0388 |
| Voltage change factor | 0,0758 | 0,0758 | 0,0758 | 0,0758 |
| Maximum inrush current factor | 0,000 | | | |
| Maximum inrush current factor (transient only) | 0,000 | | | |
| Worst case over all switching operations | 0,038 | | | |

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| | |
|---|---|
| Worst case over all switching operations (transient only) | 0,040 |
| Note: $S_{k, fic}/S_n$ in the fictitious grid was set to | 20 |

| Flicker | | | | |
|---|---|---|---|---|
| Grid impedance angle | 30° | 50° | 70° | 85° |
| Flicker step factor | 0,47 | 0,69 | 0,83 | 0,87 |
| Short term flicker | 0,15 | 0,22 | 0,26 | 0,28 |
| Note: $S_{k, fic}/S_n$ in the fictitious grid was set to | 20 | | | |

| Injection of DC currents |
|---|
| The inverter has a direct current injection lower than 0,16%, in addition the inverter has a dc current monitoring and trips in case of dc current greater than 1 A in less than 200ms |

| EUT Operative condition | | $I_{dc}$ threshold [mA] | $I_{dc}$ simulated [mA] | Trip time [ma] | Ibcomp L1 [%] | Ibcomp L2 [%] | Ibcomp L3 [%] |
|---|---|---|---|---|---|---|---|
| OC1 | 33 % Pn | 1000 | >1000 | 200 | 0,156 | 0,213 | 0,068 |
| OC2 | 66% Pn | | | | -0,063 | -0,081 | -0,066 |
| OC3 | 100 % Pn | | | | -0,107 | -0,147 | -0,016 |
| % rated AC current | | | | | 0,12 | 0,12 | 0,16 |

*Tab. 13:* DC-Injection measurement values (bp 165 TL3)

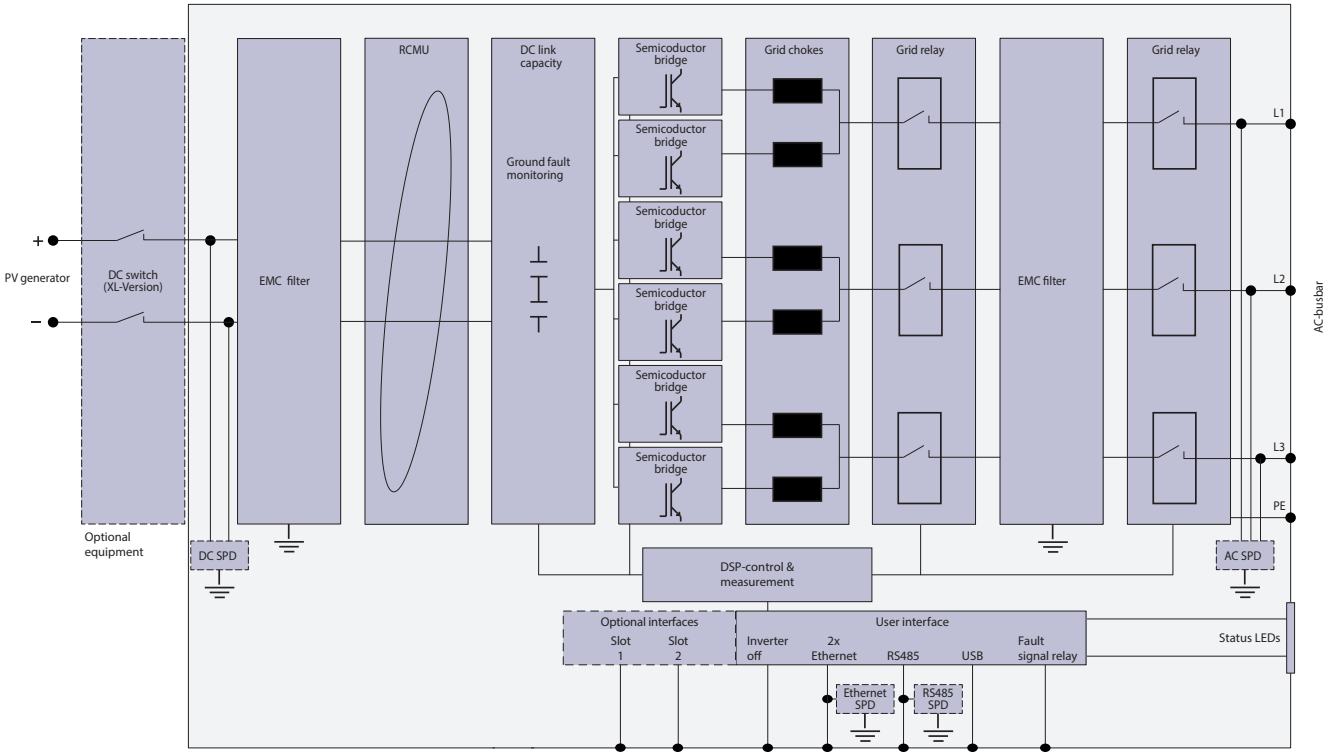



*Fig. 49:* Block schema blueplanet 87.0-165 TL3

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% In]** | **[A]** | **[% In]** |
| 1 | 140,424 | 92,38 | 148,735 | 97,85 |
| 2 | 0,141 | 0,09 | 0,145 | 0,09 |
| 3 | 0,098 | 0,06 | 0,148 | 0,10 |
| 4 | 0,157 | 0,10 | 0,194 | 0,13 |
| 5 | 0,974 | 0,64 | 0,689 | 0,45 |
| 6 | 0,145 | 0,10 | 0,190 | 0,13 |

| Harmonics | 50 Hz | | 60 Hz | |
|---|---|---|---|---|
| | **[A]** | **[% In]** | **[A]** | **[% In]** |
| 7 | 0,717 | 0,47 | 0,898 | 0,59 |
| 8 | 0,138 | 0,09 | 0,162 | 0,11 |
| 9 | 0,106 | 0,07 | 0,137 | 0,09 |
| 10 | 0,151 | 0,10 | 0,187 | 0,12 |
| 11 | 0,376 | 0,25 | 0,824 | 0,54 |
| 12 | 0,139 | 0,09 | 0,178 | 0,12 |
| 13 | 0,286 | 0,19 | 0,500 | 0,33 |
| 14 | 0,104 | 0,07 | 0,151 | 0,10 |
| 15 | 0,091 | 0,06 | 0,150 | 0,10 |
| 16 | 0,154 | 0,10 | 0,164 | 0,11 |
| 17 | 0,246 | 0,16 | 0,495 | 0,33 |
| 18 | 0,146 | 0,10 | 0,161 | 0,11 |
| 19 | 0,241 | 0,16 | 0,473 | 0,31 |
| 20 | 0,116 | 0,08 | 0,123 | 0,08 |
| 21 | 0,095 | 0,06 | 0,134 | 0,09 |
| 22 | 0,148 | 0,10 | 0,130 | 0,09 |
| 23 | 0,213 | 0,14 | 0,444 | 0,29 |
| 24 | 0,133 | 0,09 | 0,113 | 0,07 |
| 25 | 0,216 | 0,14 | 0,424 | 0,28 |
| 26 | 0,098 | 0,06 | 0,104 | 0,07 |
| 27 | 0,073 | 0,05 | 0,110 | 0,07 |
| 28 | 0,146 | 0,10 | 0,114 | 0,08 |
| 29 | 0,166 | 0,11 | 0,367 | 0,24 |
| 30 | 0,124 | 0,08 | 0,107 | 0,07 |
| 31 | 0,210 | 0,14 | 0,307 | 0,20 |
| 32 | 0,086 | 0,06 | 0,092 | 0,06 |
| 33 | 0,071 | 0,05 | 0,091 | 0,06 |
| 34 | 0,097 | 0,06 | 0,104 | 0,07 |
| 35 | 0,168 | 0,11 | 0,254 | 0,17 |
| 36 | 0,123 | 0,08 | 0,088 | 0,06 |
| 37 | 0,177 | 0,12 | 0,231 | 0,15 |
| 38 | 0,082 | 0,05 | 0,077 | 0,05 |
| 39 | 0,058 | 0,04 | 0,075 | 0,05 |
| 40 | 0,072 | 0,05 | 0,079 | 0,05 |
| 41 | 0,130 | 0,09 | 0,178 | 0,12 |
| 42 | 0,112 | 0,07 | 0,069 | 0,05 |
| 43 | 0,146 | 0,10 | 0,151 | 0,10 |
| 44 | 0,086 | 0,06 | 0,066 | 0,04 |
| 45 | 0,045 | 0,03 | 0,052 | 0,03 |
| 46 | 0,070 | 0,05 | 0,054 | 0,04 |
| 47 | 0,107 | 0,07 | 0,120 | 0,08 |
| 48 | 0,097 | 0,06 | 0,053 | 0,04 |
| 49 | 0,105 | 0,07 | 0,099 | 0,07 |
| 50 | 0,068 | 0,04 | 0,056 | 0,04 |

*Tab. 14:* Harmonics 50 Hz and 60 Hz

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## Deratingverhalten

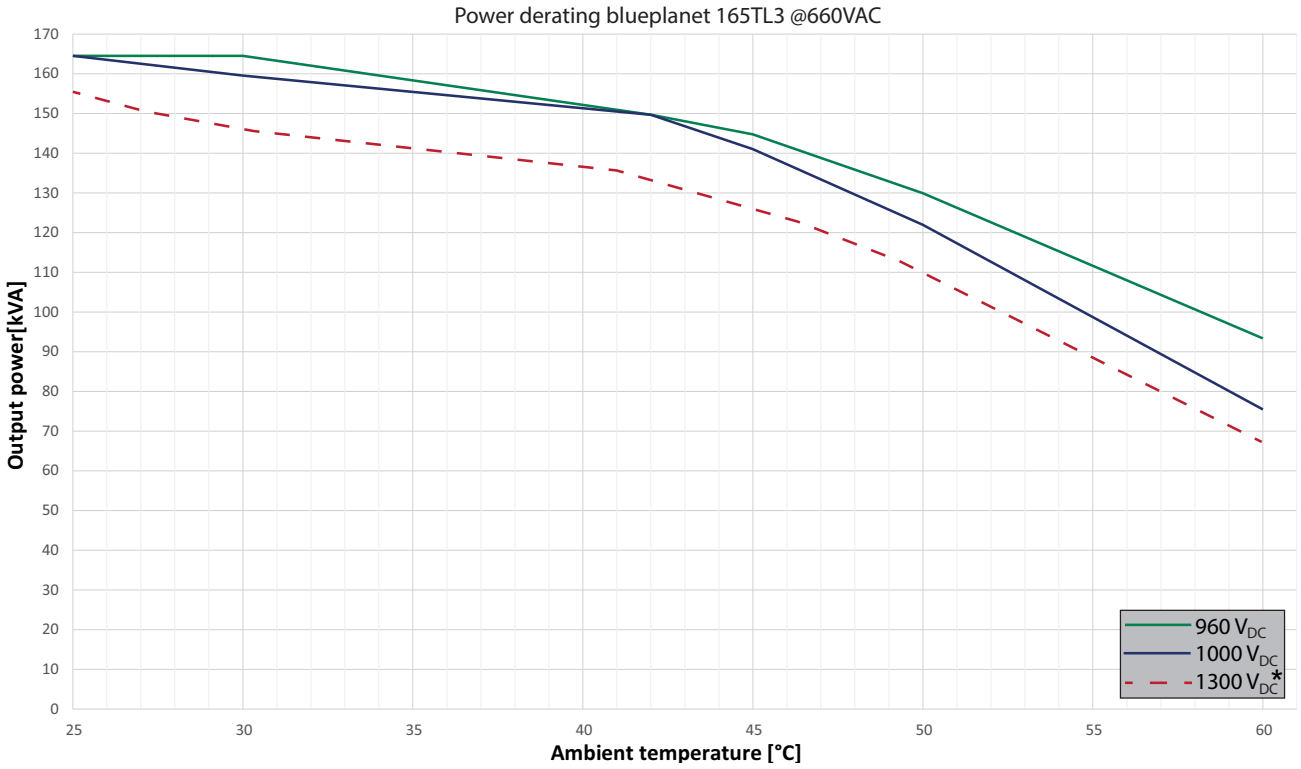



*Fig. 50:* Power derating blueplanet 165 TL3

**) Due to the thermal characteristics of solar modules an operational DC voltage of 1300VDC is not to be expected at higher ambient temperatures in the vast majority of system designs.*

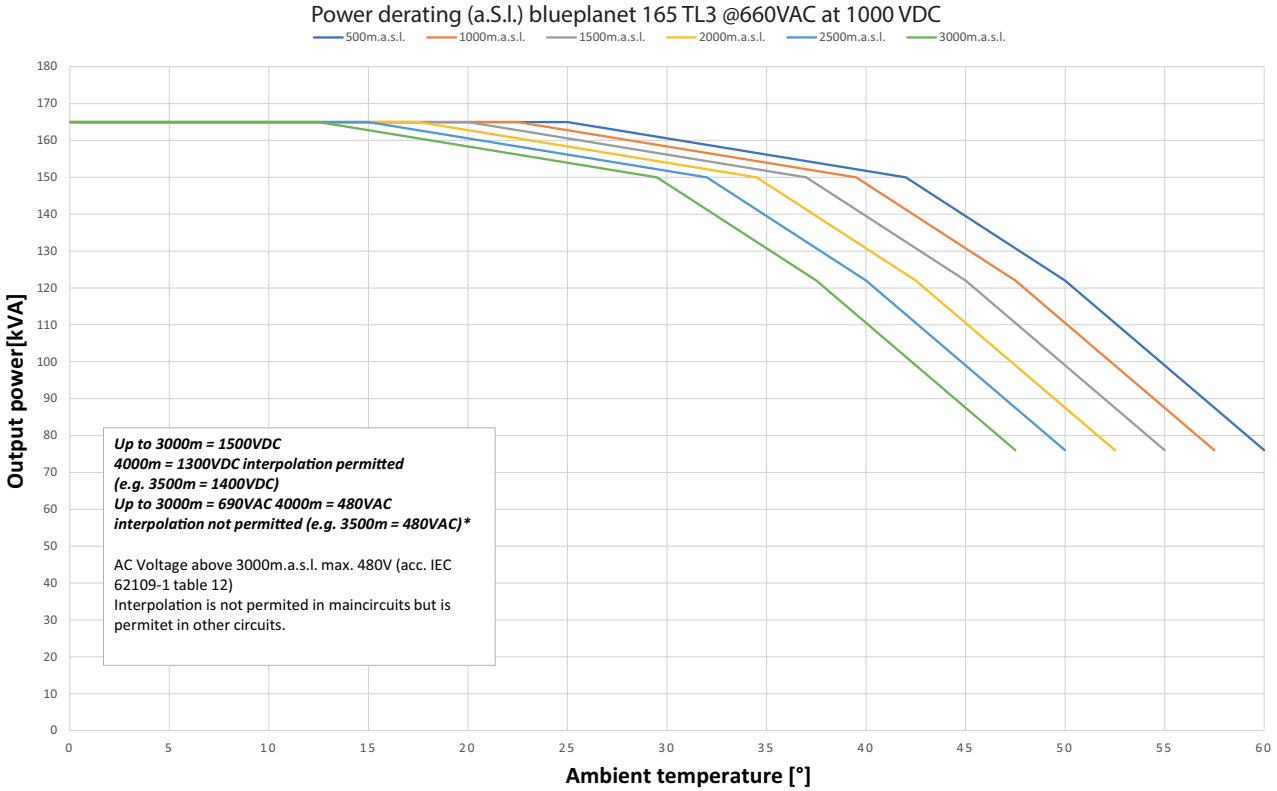



*Fig. 51:* Power reduction in relation to the height above sea level blueplanet 165 TL3

**) The provided values are simulation results and may vary from actual performance data under real operating conditions.*

## Efficiency characteristic

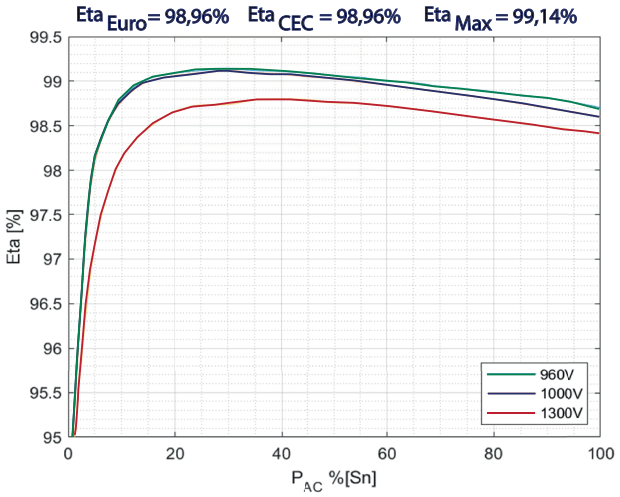



*Fig. 52:* 2D Diagram blueplanet 165TL3

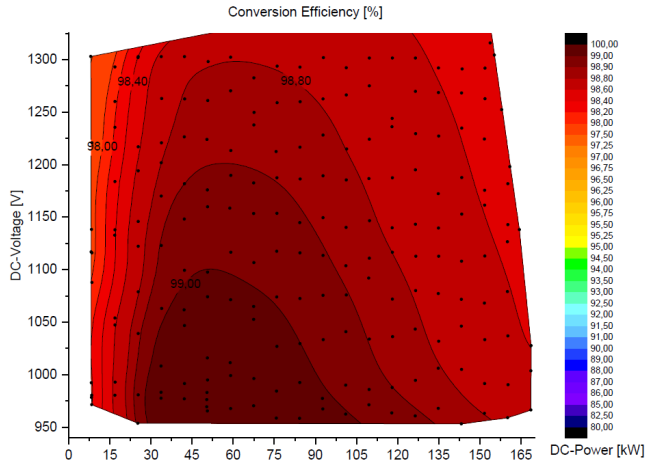



*Fig. 53:* 3D Diagram blueplanet 165TL3

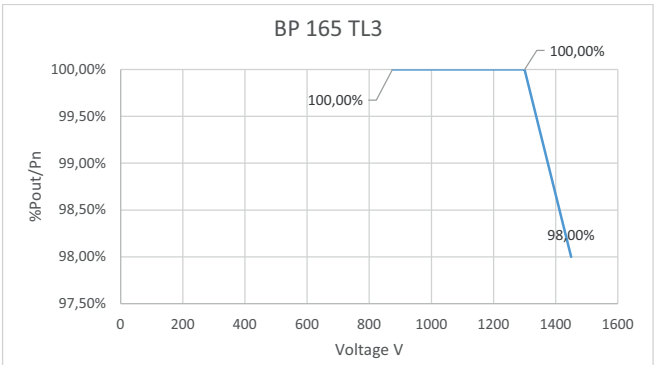



*Fig. 54:* 2D Diagram %Pout/Pn vs Voltage 165 TL3

## P-Q Diagram depanding on operating voltage

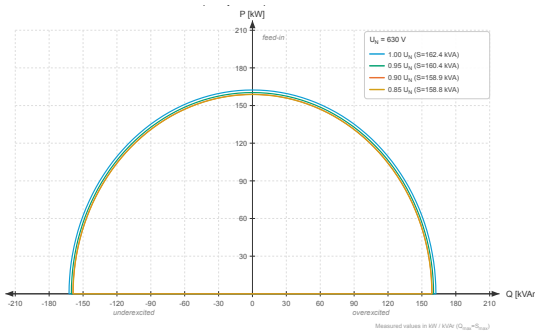



*Fig. 55:* P-Q operating range for bp 165 TL3 ($Q_{max}$=$S_{max}$)

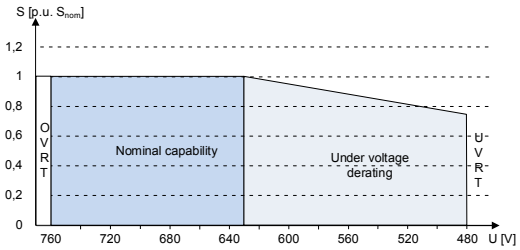



*Fig. 56:* Apparent power subject to the grid voltage for bp 165 TL3

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