# Seasonic Focus Plus Gold 650W

Serial Number R1705AA135760494

Lab ID 132

Certification ID 25132

Test Result Report ID:

Certificate Issue Date: Jun 27, 2018

115V

Scheme: ETA-EMI PSU




115V




Scheme: LAMBDA PSU



Aristeidis Bitziopoulos, Certification Body General Manager

# General Information

## Test Equipment

| | |
|---|---|
| Electronic Loads | Chroma 63601-5 x2<br>Chroma 63600-2<br>Chroma 63640-80-80 x10<br>Chroma 63610-80-20 |
| AC Sources | Chroma 6530, APM SP300VAC4000W-P, GW Instek ASR-3500 |
| Power Analyzers | Rohde & Schwarz HMC8015 & NPA701 |
| Oscilloscopes | Picoscope 4444, Siglent SDS2104X PLUS |
| Sound Analyzer | Bruel & Kjaer 2270 G4 |
| Microphone | Bruel & Kjaer Type 4955-A |
| Temperature Logger | Picoscope TC-08 |
| Tachometer | UNI-T UT372 |
| Multimeters | Keysight 34465A |
| EMI Analyzer | TekBox TBMR-110M-EU |
| Isolation Transformer | 4kVA |
| UPS | FSP Champ Tower 3kVA, CyberPower OLS3000E 3kVA |
| Testing Methodology | Cybenetics PSU Test Protocol |

## DUT Information(Non-accredited measurements)

| | |
|---|---|
| Product Identification Details | |
| Brand | Seasonic |
| Model | Focus Plus Gold 650W |
| OEM/ODM | Seasonic |
| Serial Number | R1705AA135760494 |
| Product Specifications | |
| Manufacturer-Provided Information | |
| Rated Voltage (Vrms) | 100-240 |
| Rated Current (Arms) | 9-4.5 |
| Rated Frequency (Hz) | 50-60 |

| | |
|---|---|
| Rated Power (W) | 650 |
| Operating Temperature (Continuous Full Load) (°C) | |
| Type | ATX12V |
| Cable Design | Fully Modular |
| Warranty | - |
| Cybenetics Measurements | |
| Dimensions (W x H x D) | |
| Weight | |
| Cooling | 120mm Fluid Dynamic Bearing Fan<br>(HA1225H12F-Z) |
| Semi-Passive Operation | ✓ (selectable) |
| Cybenetics Testing Information | |
| Lab ID | 132 |
| Date of receipt | Jun 13, 2018 |
| Testing Date | Jun 25, 2018 |
| Report Issued Date | Jun 27, 2018 |
| Engineer Name | - |
| Authorized By the Laboratory Technical Manager | Aristeidis Bitziopoulos |
| Signature |  |

## Cables and Connectors(Non-accredited measurements)

| Modular Cables | | | |
|---|---|---|---|
| Description | Cable Count | Connector Count (Total) | Gauge |
| ATX connector 20+4 pin (610mm) | 1 | 1 | 18-22AWG |
| 4+4 pin EPS12V (655mm) | 1 | 1 | 18AWG |
| 6+2 pin PCIe (680mm+80mm) | 2 | 4 | 18AWG |
| SATA (455mm+115mm+115mm+115mm) | 2 | 8 | 18AWG |
| 4 pin Molex (460mm+125mm+125mm) | 1 | 3 | 18AWG |
| FDD Adapter (+110mm) | 1 | 1 | 22AWG |

## Power Specifications

| Rail | | 3.3V | 5V | 12V | 5VSB | -12V |
|---|---|---|---|---|---|---|
| Max. Power | Amps | 20 | 20 | 54 | 3 | 0.3 |
| | Watts | 100 | | 648 | 15 | 3.6 |
| Total Max. Power (W) | | 650 | | | | |

## Parts Description

| General Data | |
|---|---|
| Manufacturer (OEM) | Seasonic |
| Platform Model | FX |
| Primary Side | |
| Transient Filter | 4x Y caps, 2x X caps, 2x CM chokes, 1x MOV |
| Inrush Protection | NTC Thermistor & Diode |
| Bridge Rectifier(s) | 2x GBU1006 (600V, 10A @ 100°C) |
| APFC MOSFETS | 2x UTC GPT18N50DG (500V, 18A @ 100°C, 0.265Ohm) |
| APFC Boost Diode | 1x BYC8-600 (600V, 8A @ 109°C) |
| Hold-up Cap(s) | 1x Nippon Chemi-Con (400V, 450uF, 2000h @ 105°C, CE) |
| Main Switchers | 4x UTC GBT10N50ADG<br>(500V, 10A @ 25°C, 0.61Ohm) |
| APFC Controller | Champion CM6500UNX |
| Resonant Controller | Champion CM6901T6X |
| Topology | Primary side: Full-Bridge & LLC Resonant Controller<br>Secondary side: Synchronous Rectification & DC-DC converters |
| Secondary Side | |
| +12V MOSFETS | 2x Nexperia PSMN1R8-40YLC (40V, 100A @ 25°C, 1.8mOhm) |
| 5V & 3.3V | DC-DC Converters: 6x Infineon BSC0906NS (30V, 40A @ 100°C, 4.5mOhm)<br>PWM Controller: APW7159 |
| Filtering Capacitors | Electrolytics: Chemi-Con (1-5,000 @ 105°C, KZE), Chemi-Con (4-10,000 @ 105°C, KY), Chemi-Con (105°C, W)<br>Polymers: Chemi-Con |
| Supervisor IC | Weltrend WT7527V (OVP, UVP, OCP, SCP, PG) |
| Fan Model | Hong Hua HA1225H12F-Z (120mm, 12V, 0.58A, 2200 RPM, Fluid Dynamic Bearing) |
| 5VSB Circuit | |

| | |
|---|---|
| Standby PWM Controller | Excelliance EM8569 |

## Test Results

### Temperature & Compliance Info

| | |
|---|---|
| Temperature Range (°C /°F) | 28-32 / 82.4-89.6 |
| ErP Lot 3/6 Ready | ✓ |
| (EU) No 617/2013 Compliance | ✓ |

### Performance Summary 115V

| | |
|---|---|
| Accredited | |
| Average Efficiency (>1450 load combinations) | 87.957% |
| Average Noise Output (>1450 Load Combinations) | 26.34dBA |
| Average PF (>1450 Load Combinations) | 0.987 |
| Efficiency With 10W (≤500W) or 2% (>500W) Load | - |
| Standby Power Consumption | 0.0456W |
| Non-Accredited | |
| 12V Ripple (Full Load) | 30.01mV |
| 5V Ripple (Full Load) | 11.67mV |
| 3.3V Ripple (Full Load) | 11.50mV |
| 5VSB Ripple (Full Load) | 11.18mV |
| 12V Load Regulation | 0.11% |
| 5V Load Regulation | 0.44% |
| 3.3V Load Regulation | 0.60% |
| 5VSB Load Regulation | 3.06% |
| Inrush Current | 38.237A |

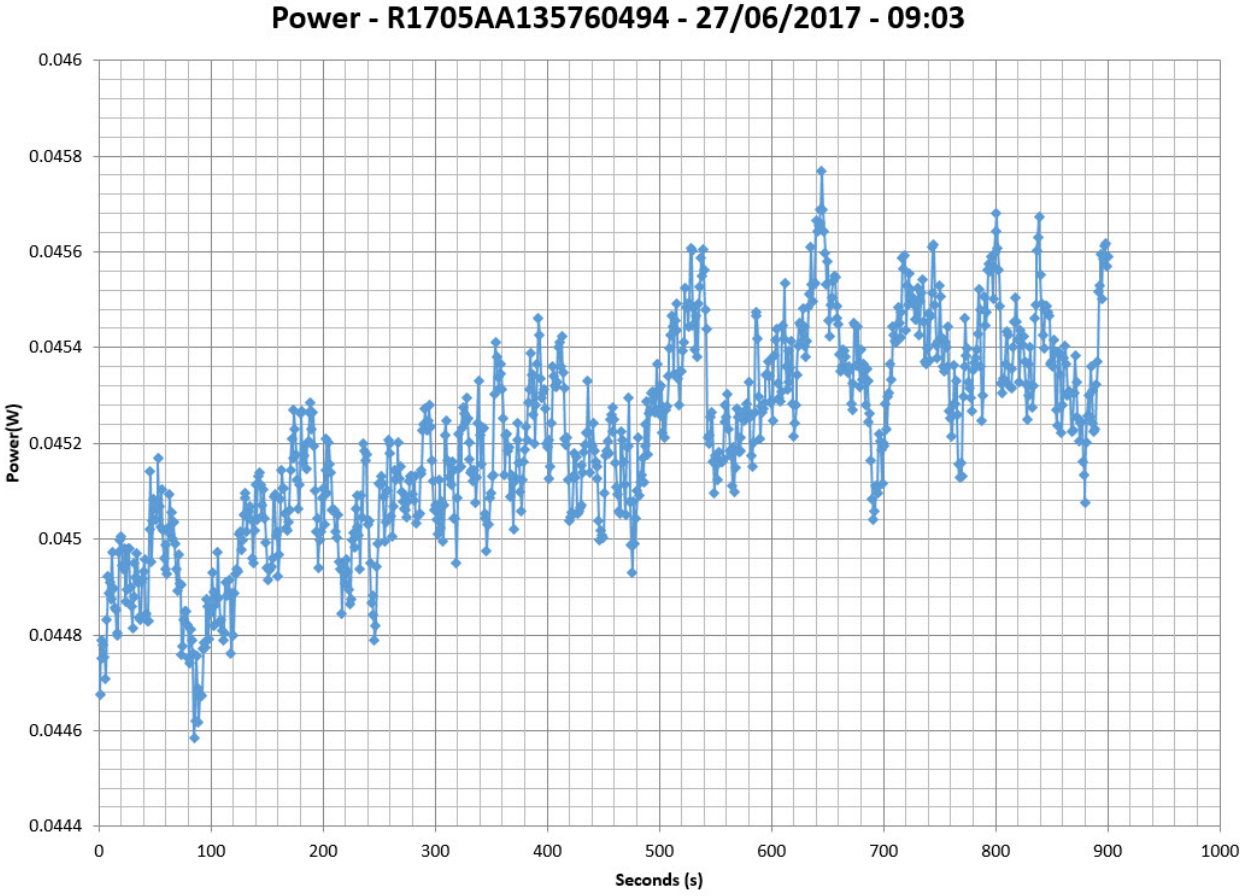
## Hold-Up Time & PWR_OK Signal

| | |
|---|---|
| Hold-Up Time (ms) | 21.5 |
| AC Loss to PWR_OK Hold Up Time (ms) | 20.7 |

| | |
|---|---|
| PWR_OK Inactive to DC Loss Delay (ms) | 0.8 |

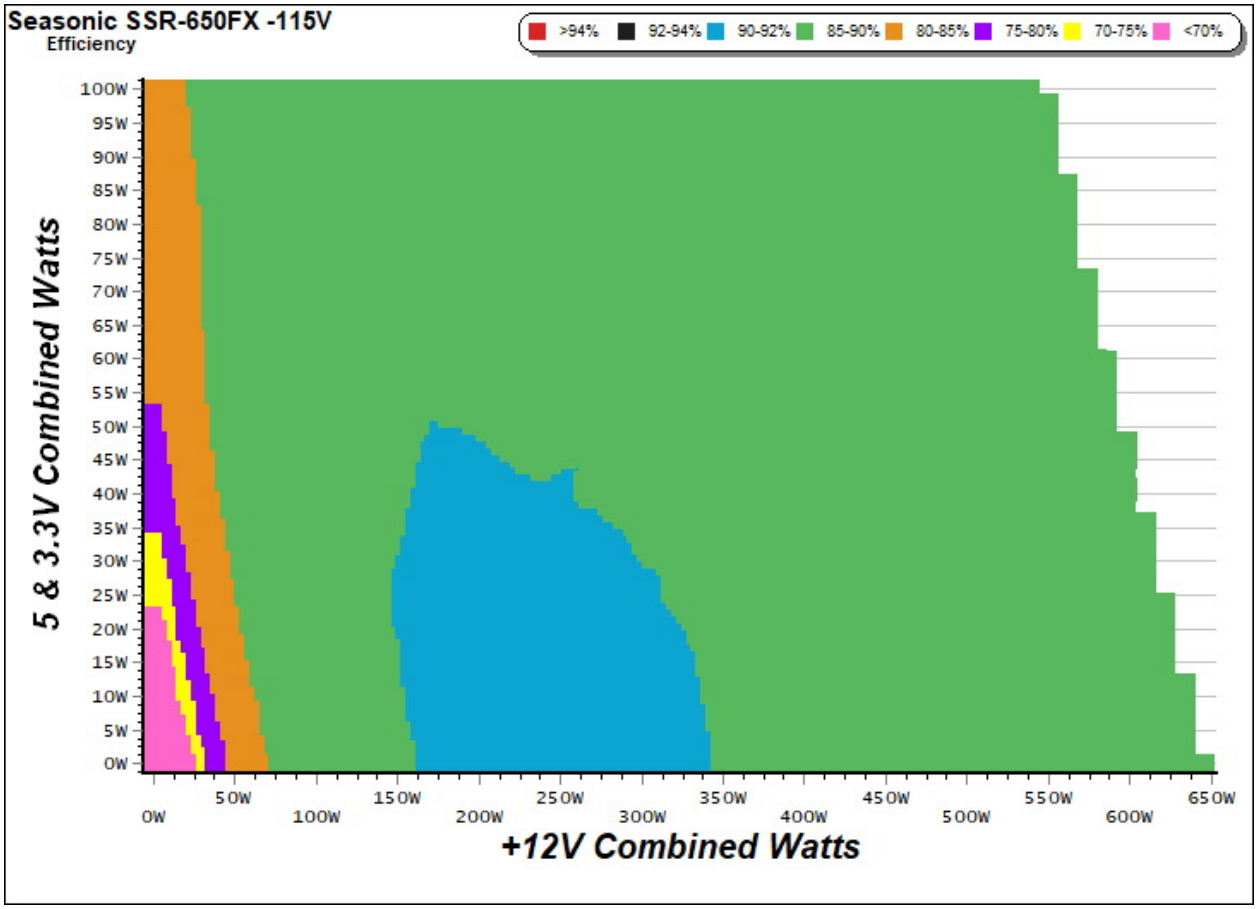
## Stromverbrauch im Ruhezustand

### Graphs 115V



## Efficiency Graph

### 115V

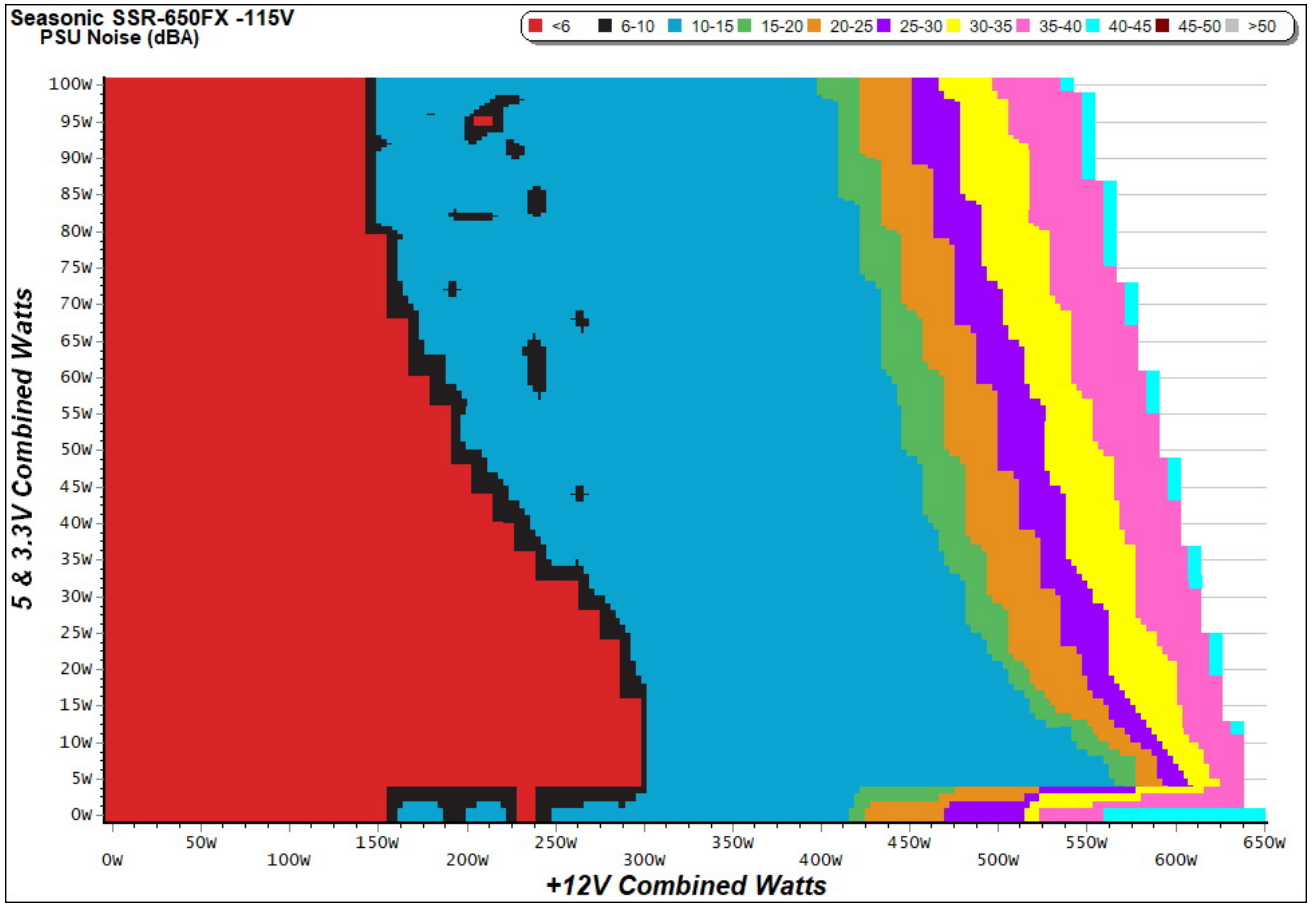



### INFO

This graph depicts the PSU`s efficiency throughout its entire operational range. For the generation of the efficiency and noise graphs we set our loaders to auto mode through our custom-made software before trying thousands of possible load combinations.

## Noise Graph

### 115V

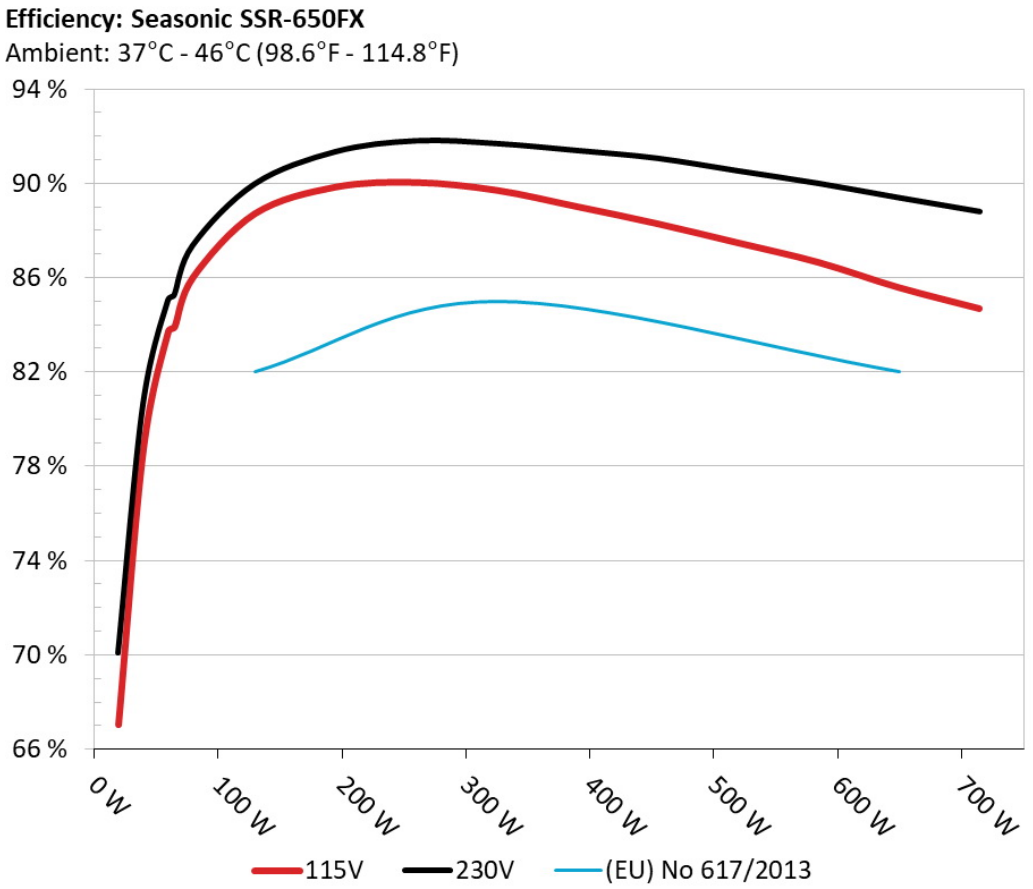



### INFO

The PSU`s noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails.

## Indicative Performance

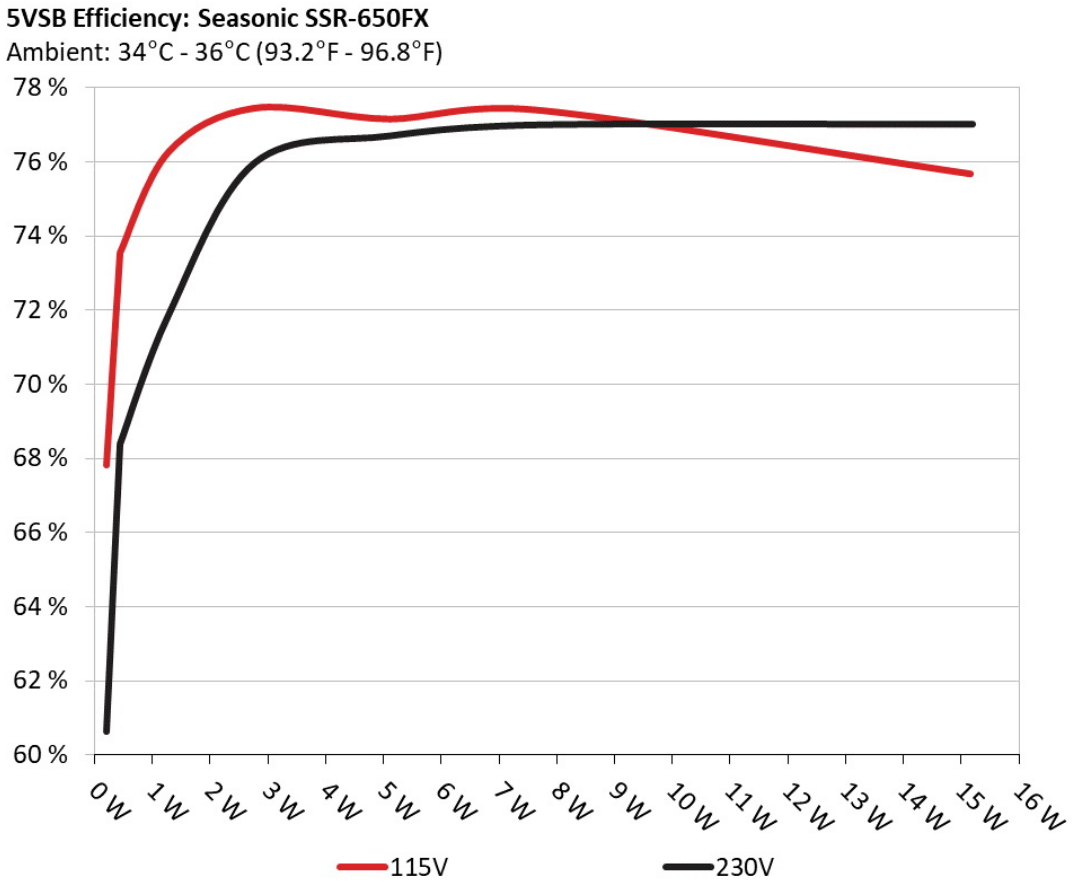
### Efficiency under high ambient temperature




**INFO**

The PSU`s efficiency under high ambient temperatures with 115V and 230V input. For this graph the results of the 10-110% load regulation table are used.

## 5VSB Efficiency




### INFO

This graph depicts the efficiency levels of the 5VSB rail with 115V and 230V input.

## 5VSB Efficiency (ERP LOT 3/6 & CEC) 115V

| Test # | 5VSB | DC/AC (Watts) | Efficiency | PF/AC Volts |
|---|---|---|---|---|
| 1 | 0.041A | 0.213 | 67.834% | 0.052 |
| | 5.135V | 0.314 | | 115.11V |

| | | | | |
|---|---|---|---|---|
| 2 | 0.087A | 0.447 | 73.520% | 0.098 |
| | 5.133V | 0.608 | | 115.13V |
| 3 | 0.542A | 2.775 | 77.449% | 0.334 |
| | 5.122V | 3.583 | | 115.13V |
| 4 | 1.002A | 5.120 | 77.155% | 0.405 |
| | 5.111V | 6.636 | | 115.13V |
| 5 | 1.502A | 7.657 | 77.398% | 0.439 |
| | 5.099V | 9.893 | | 115.14V |
| 6 | 3.001A | 15.163 | 75.679% | 0.484 |
| | 5.052V | 20.036 | | 115.14V |

## Supplementary Tests (For Reference)

### Typical Load Tests 115V

| Test # | 12V | 5V | 3.3V | 5VSB | DC/AC (Watts) | Efficiency | Fan Speed (RPM) | Fan Noise (dB[A]) | Temps (In/Out) | PF/AC Volts |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3.524A | 1.985A | 1.978A | 0.981A | 64.785 | 83.886% | 0 | \| 6.0 | 44.17°C | 0.957 |
| | 12.260V | 5.031V | 3.332V | 5.100V | 77.230 | | | | 41.62°C | 115.17V |
| 2 | 8.066A | 2.980A | 2.968A | 1.176A | 129.741 | 88.711% | 0 | \| 6.0 | 44.71°C | 0.980 |
| | 12.260V | 5.029V | 3.330V | 5.087V | 146.252 | | | | 41.88°C | 115.17V |
| 3 | 12.953A | 3.488A | 3.480A | 1.375A | 194.878 | 89.839% | 0 | \| 6.0 | 45.38°C | 0.987 |
| | 12.259V | 5.026V | 3.328V | 5.073V | 216.920 | | | | 42.06°C | 115.16V |
| 4 | 17.830A | 3.982A | 3.964A | 1.580A | 259.745 | 90.035% | 0 | \| 6.0 | 45.79°C | 0.990 |
| | 12.258V | 5.024V | 3.326V | 5.060V | 288.493 | | | | 42.23°C | 115.16V |
| 5 | 22.371A | 4.976A | 4.960A | 1.781A | 324.680 | 89.702% | 550 | 10.4 | 40.25°C | 0.991 |
| | 12.258V | 5.022V | 3.323V | 5.045V | 361.956 | | | | 48.56°C | 115.16V |
| 6 | 26.912A | 5.976A | 5.957A | 1.985A | 389.646 | 89.008% | 560 | 10.5 | 41.08°C | 0.991 |
| | 12.258V | 5.019V | 3.321V | 5.029V | 437.766 | | | | 50.62°C | 115.15V |
| 7 | 31.449A | 6.981A | 6.959A | 2.190A | 454.567 | 88.286% | 735 | 15.4 | 41.65°C | 0.992 |
| | 12.257V | 5.017V | 3.318V | 5.015V | 514.881 | | | | 51.38°C | 115.16V |
| 8 | 36.000A | 7.975A | 7.960A | 2.400A | 519.523 | 87.474% | 1300 | 32.4 | 43.03°C | 0.993 |
| | 12.254V | 5.014V | 3.316V | 4.999V | 593.917 | | | | 53.07°C | 115.15V |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 40.979A | 8.481A | 8.473A | 2.401A | 584.571 | 86.643% | 1960 | 41.4 | 43.89°C | 0.993 |
| | 12.250V | 5.012V | 3.315V | 4.991V | 674.691 | | | | 53.87°C | 115.15V |
| 10 | 45.700A | 8.989A | 8.963A | 3.015A | 649.398 | 85.575% | 2320 | 45.2 | 44.70°C | 0.994 |
| | 12.247V | 5.010V | 3.313V | 4.969V | 758.863 | | | | 54.76°C | 115.14V |
| 11 | 51.006A | 8.990A | 8.966A | 3.020A | 714.331 | 84.685% | 2330 | 45.4 | 46.12°C | 0.994 |
| | 12.246V | 5.009V | 3.312V | 4.962V | 843.518 | | | | 56.50°C | 115.14V |
| CL1 | 0.100A | 12.012A | 12.005A | 0.004A | 101.428 | 83.993% | 560 | 10.5 | 43.48°C | 0.975 |
| | 12.265V | 5.020V | 3.322V | 5.101V | 120.757 | | | | 56.63°C | 115.19V |
| CL2 | 54.121A | 1.004A | 1.003A | 1.002A | 676.286 | 85.925% | 2330 | 45.4 | 45.60°C | 0.994 |
| | 12.248V | 5.017V | 3.322V | 5.033V | 787.070 | | | | 55.33°C | 115.14V |

The results above are not used in the certification process

## Light Load Tests 115V

| Test # | 12V | 5V | 3.3V | 5VSB | DC/AC (Watts) | Efficiency | Fan Speed (RPM) | Fan Noise (dB[A]) | PF/AC Volts |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.189A | 0.493A | 0.476A | 0.196A | 19.647 | 67.023% | 0 | \| 6.0 | 0.809 |
| | 12.254V | 5.040V | 3.338V | 5.126V | 29.314 | | | | 115.16V |
| 2 | 2.405A | 0.990A | 0.989A | 0.390A | 39.749 | 78.730% | 0 | \| 6.0 | 0.916 |
| | 12.255V | 5.032V | 3.333V | 5.120V | 50.488 | | | | 115.16V |
| 3 | 3.620A | 1.486A | 1.500A | 0.586A | 59.843 | 83.708% | 0 | \| 6.0 | 0.952 |
| | 12.257V | 5.032V | 3.333V | 5.112V | 71.490 | | | | 115.16V |
| 4 | 4.829A | 1.985A | 1.978A | 0.781A | 79.755 | 86.006% | 0 | \| 6.0 | 0.965 |
| | 12.258V | 5.031V | 3.332V | 5.102V | 92.732 | | | | 115.16V |

The results above are not used in the certification process

## Ripple Measurements 115V

| Test | 12V | 5V | 3.3V | 5VSB | Pass/Fail |
|---|---|---|---|---|---|
| 10% Load | 8.6 mV | 5.9 mV | 6.1 mV | 5.7 mV | Pass |
| 20% Load | 12.4 mV | 5.3 mV | 5.6 mV | 5.4 mV | Pass |
| 30% Load | 15.6 mV | 6.5 mV | 6.2 mV | 5.2 mV | Pass |
| 40% Load | 17.6 mV | 6.9 mV | 6.3 mV | 5.9 mV | Pass |

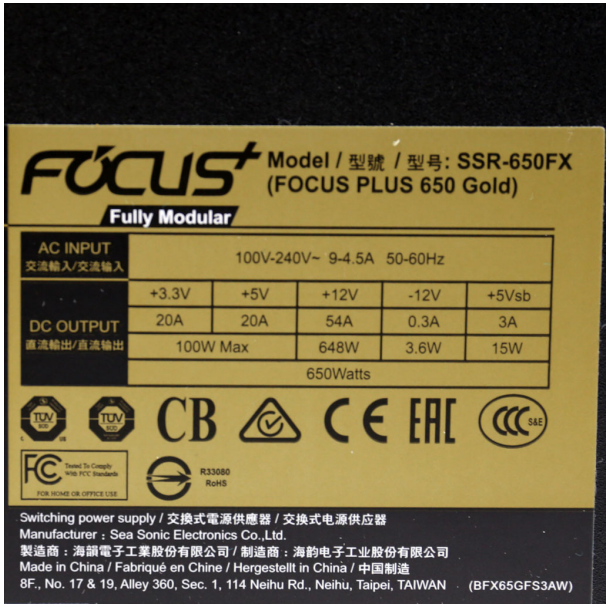
| Test | 12V | 5V | 3.3V | 5VSB | Pass/Fail |
|---|---|---|---|---|---|
| 50% Load | 19.9 mV | 7.4 mV | 8.3 mV | 5.9 mV | Pass |
| 60% Load | 22.0 mV | 8.3 mV | 8.7 mV | 7.5 mV | Pass |
| 70% Load | 24.0 mV | 9.4 mV | 8.2 mV | 7.3 mV | Pass |
| 80% Load | 25.8 mV | 9.6 mV | 10.1 mV | 10.2 mV | Pass |
| 90% Load | 27.4 mV | 10.8 mV | 9.6 mV | 10.6 mV | Pass |
| 100% Load | 30.0 mV | 11.7 mV | 11.5 mV | 11.2 mV | Pass |
| 110% Load | 31.9 mV | 12.1 mV | 12.1 mV | 11.3 mV | Pass |
| Crossload 1 | 14.1 mV | 10.3 mV | 8.3 mV | 9.0 mV | Pass |
| Crossload 2 | 28.9 mV | 10.6 mV | 10.5 mV | 10.7 mV | Pass |

The results above are not used in the certification process

## Seasonic Focus Plus Gold 650W




Top side




Power specifications label

Cybenetics bietet freiwillige Zertifizierungsprogramme für Netzteile – ETA für Effizienz, LAMBDA für Lautstärke und SAFE für Sicherheit und korrekten Betrieb – sowie für Kühlprodukte mit DELTA für die Schalldämmung von Gehäusen und PHI für Luftstrom und statischen Druck von Lüftern