



Fractal Design ION+ 860P

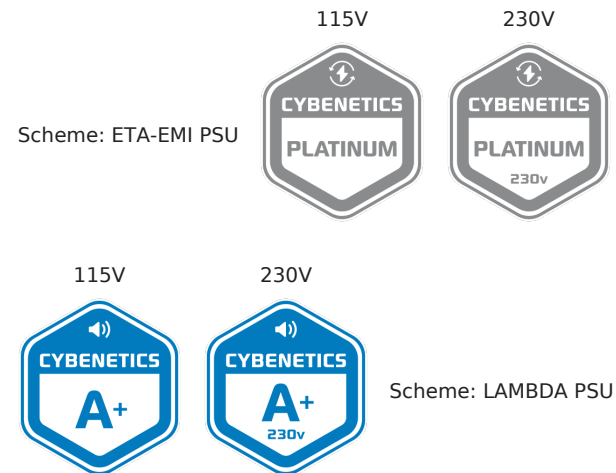
Serial Number 1918FD19270100399

Lab ID FD19860073

Certification ID 25764

Test Result Report ID:

Certificate Issue Date: Jul 18, 2019



A handwritten signature in blue ink, appearing to read 'A. Bitziopoulos', is positioned above the name of the Certification Body General Manager.

Aristeidis Bitziopoulos, Certification Body General Manager

General Information

Test Equipment

Electronic Loads	Chroma 63601-5 x2 Chroma 63600-2 Chroma 63640-80-80 x10 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	Fractal Design
Model	ION+ 860P
OEM/ODM	High Power
Serial Number	1918FD19270100399
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10-5
Rated Frequency (Hz)	50-60

Rated Power (W)	860
Operating Temperature (Continuous Full Load) (°C)	
Type	ATX12V
Cable Design	Fully Modular
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
Cooling	140mm Fluid Dynamic Bearing Fan (DYNAMIC X2 GP-14)
Semi-Passive Operation	✓ (selectable)
Cybenetics Testing Information	
Lab ID	FD19860073
Date of receipt	Nov 7, 2019
Testing Date	Jul 15, 2019
Report Issued Date	Jul 18, 2019
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	In Cable Capacitors
ATX connector 20+4 pin (600mm)	1	1	18AWG	No
4+4 pin EPS12V (700mm)	1	1	16AWG	No
8 pin EPS12V (600mm)	1	1	16AWG	No
6+2 pin PCIe (560mm+120mm)	3	6	16-18AWG	No
SATA (650mm+120mm)	1	2	18AWG	No
SATA (400mm+120mm+120mm+120mm)	2	8	18AWG	No
4 pin Molex (400mm+120mm+120mm+120mm)	1	4	18AWG	No
AC Power Cord (1400mm) - C13 coupler	1	1	16AWG	-

Power Specifications

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	22	22	71.6	3	0.3
	Watts	120		860	15	3.6
Total Max. Power (W)		860				

Parts Description

General Data	
Manufacturer (OEM)	High Power
PCB Type	Double Sided
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 3x CM chokes, 1x MOV,1x Discharge IC
Inrush Protection	NTC Thermistor & Relay
Bridge Rectifier(s)	2x GBU1506 (600V, 15A @ 100°C)
APFC MOSFETS	2x Infineon IPA60R099P7 (650V, 20A @ 100°C, 0.099Ohm)
APFC Boost Diode	1x Infineon IDH08G65C5 (650V, 8A @ 145°C)
Hold-up Cap(s)	2x Rubycon (400V, 470uF each or 940uF combined, 2,000h @ 105°C, MXH)
Main Switchers	2x Infineon IPA60R099P7 (650V, 20A @ 100°C, 0.099Ohm)
APFC Controller	Infineon ICE3PCS01G
Resonant Controllers	Champion CM6901X
Topology	Primary side: Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETS	8x Infineon BSC010N04LS (40V, 100A @ 100°C, 1mOhm)
5V & 3.3V	DC-DC Converters:8x Infineon BSC0906NS (30V, 40A @ 100°C, 4.5mOhm) PWM Controllers: ANPEC APW7159C
Filtering Capacitors	Electrolytics: 4x Nippon Chemi-Con (4-10,000h @ 105°C, KY), 5x Rubycon (3-6,000h @ 105°C, YXG), 1x Rubycon (6-10,000h @ 105°C, ZLH) Polymers: 31x FPCAP, 6x NIC
Supervisor IC	SITI PS224 (OCP, OVP, UVP, SCP, PG)
Micro Controller	STC 15W408AS
Fan Model	Fractal Design DYNAMIC X2 GP-14 (140mm, 3-12V, 0.40A, Fluid Dynamic Bearing Fan)

Fan Power Transistor	STi 2SD882 (NPN)
5VSB Circuit	
Rectifier	1x PFC P10V45SP SBR (45V, 10A) & 2x Infineon BSC0906NS (30V, 40A @ 100°C, 4.5mΩ)
Standby PWM Controller	Excelliance MOS Corp EM8569
-12V Circuit	
Rectifier	KEC KIA7912PI (-12V, 1A)

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)	89.952%
Average Noise Output (>1450 Load Combinations)	18.05dBA
Average PF (>1450 Load Combinations)	0.993
Efficiency With 10W (≤500W) or 2% (>500W) Load	49.980%
Standby Power Consumption	0.1053W
Non-Accredited	
12V Ripple (Full Load)	22.35mV
5V Ripple (Full Load)	13.05mV
3.3V Ripple (Full Load)	16.08mV
5VSB Ripple (Full Load)	18.44mV
12V Load Regulation	0.89%
5V Load Regulation	0.60%
3.3V Load Regulation	1.06%

5VSB Load Regulation	2.31%
Inrush Current	29.398A

230V

Accredited		
Average Efficiency (>1450 load combinations)	91.727%	
Average Noise Output (>1450 Load Combinations)	17.99dBA	
Average PF (>1450 Load Combinations)	0.961	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.1402W	
Non-Accredited		
12V Ripple (Full Load)	19.82mV	
5V Ripple (Full Load)	13.22mV	
3.3V Ripple (Full Load)	15.16mV	
5VSB Ripple (Full Load)	16.96mV	
12V Load Regulation	0.87%	
5V Load Regulation	0.64%	
3.3V Load Regulation	1.12%	
5VSB Load Regulation	2.41%	
Inrush Current	85.699A	
Hold-Up Time & PWR_OK Signal	17.60ms	
AC Loss to PWR_OK Hold Up Time	16.00ms	
PWR_OK Inactive to DC Loss Delay	1.60ms	
OPP (0.00°C / 0.00°C)	136.97%	-

Hold-Up Time & PWR_OK Signal

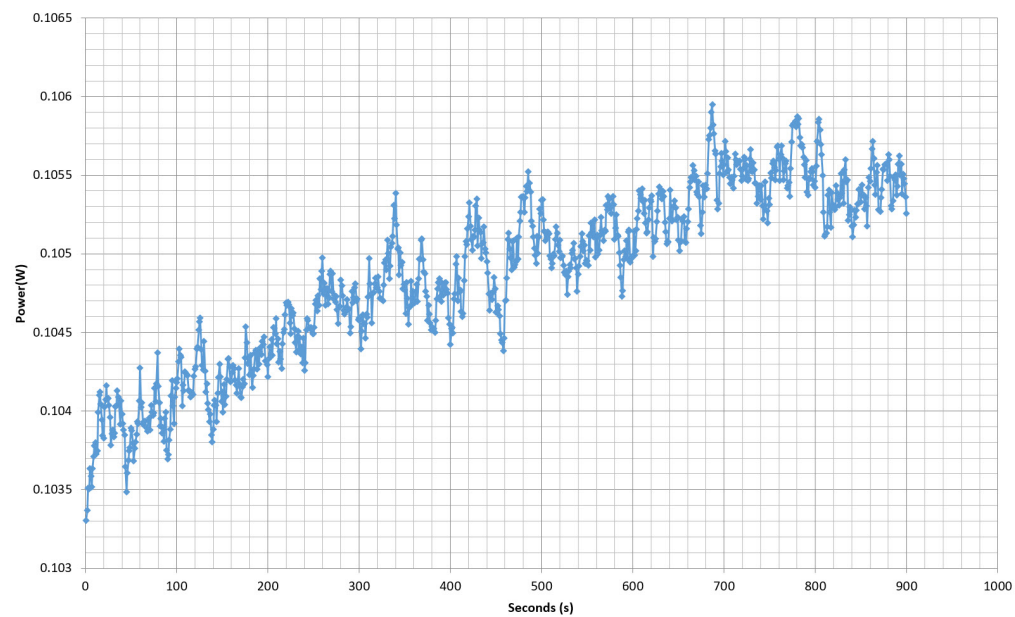
Hold-Up Time (ms)	17.6
AC Loss to PWR_OK Hold Up Time (ms)	16
PWR_OK Inactive to DC Loss Delay (ms)	1.6



Graphs

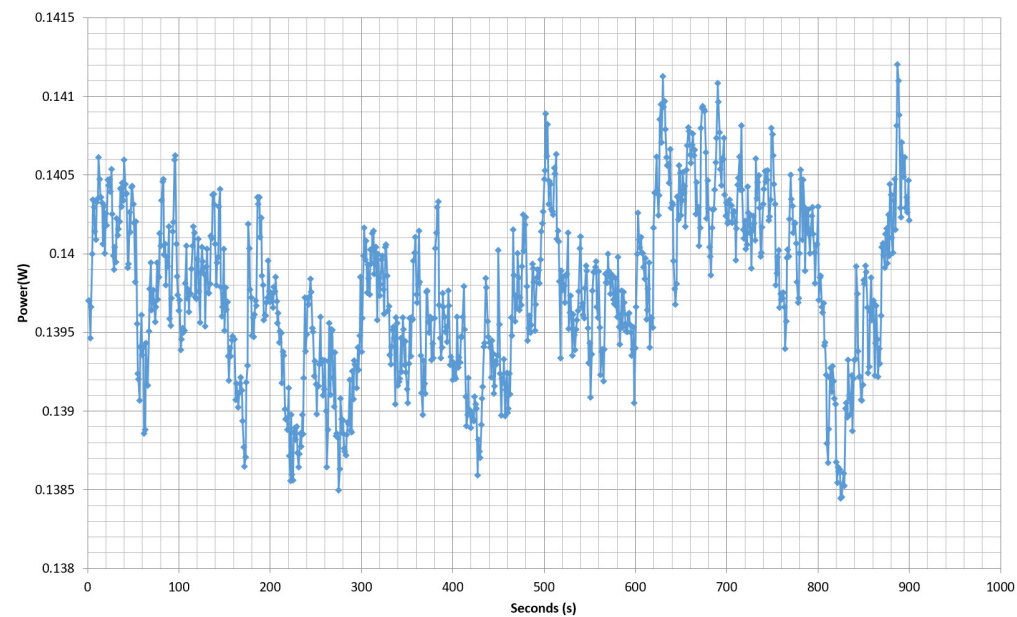
115V

Power - 1918FD19270100399 - 12/07/2019 - 12:01



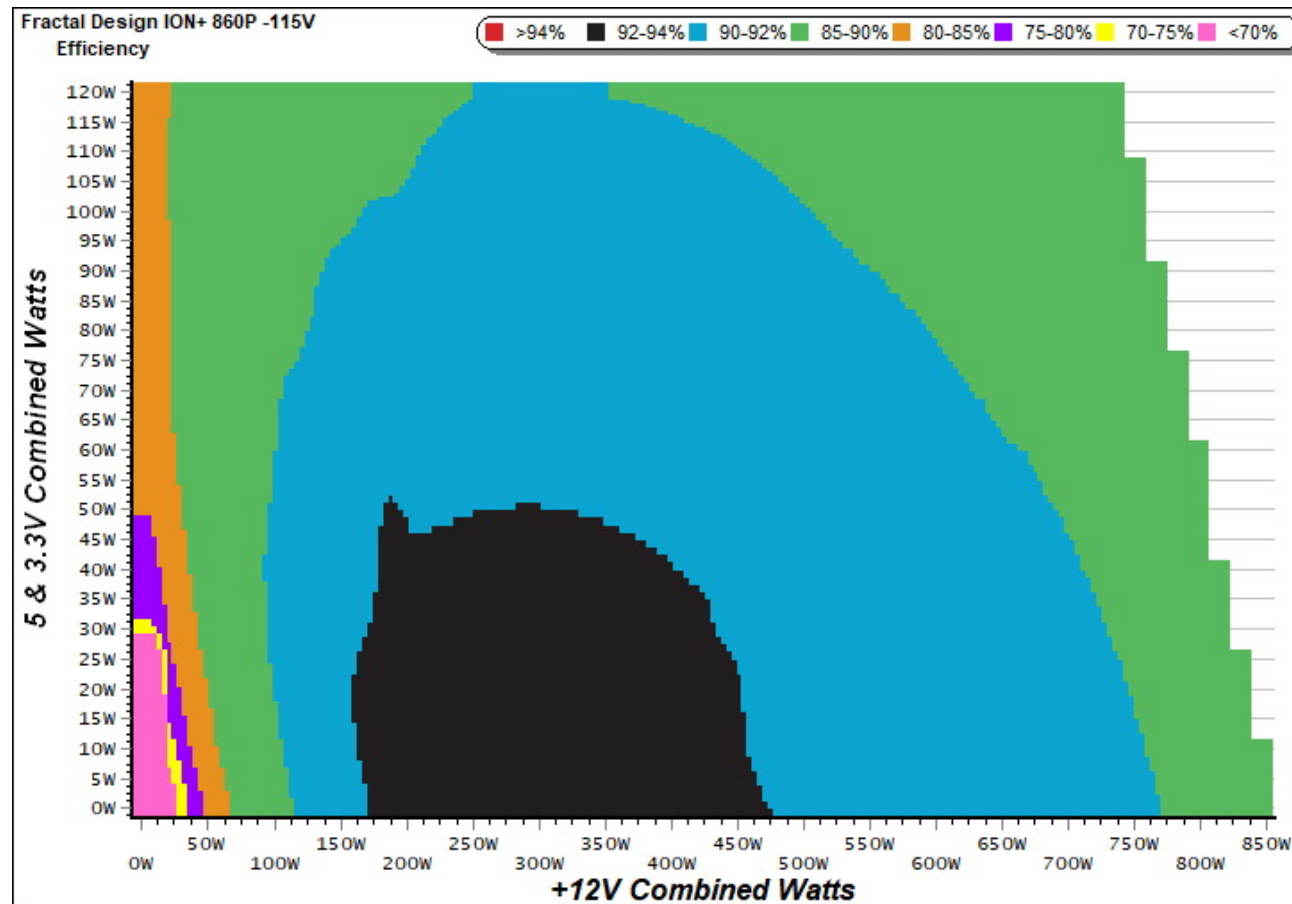
230V

Power - 1918FD19270100399 - 12/07/2019 - 12:01



Efficiency Graph

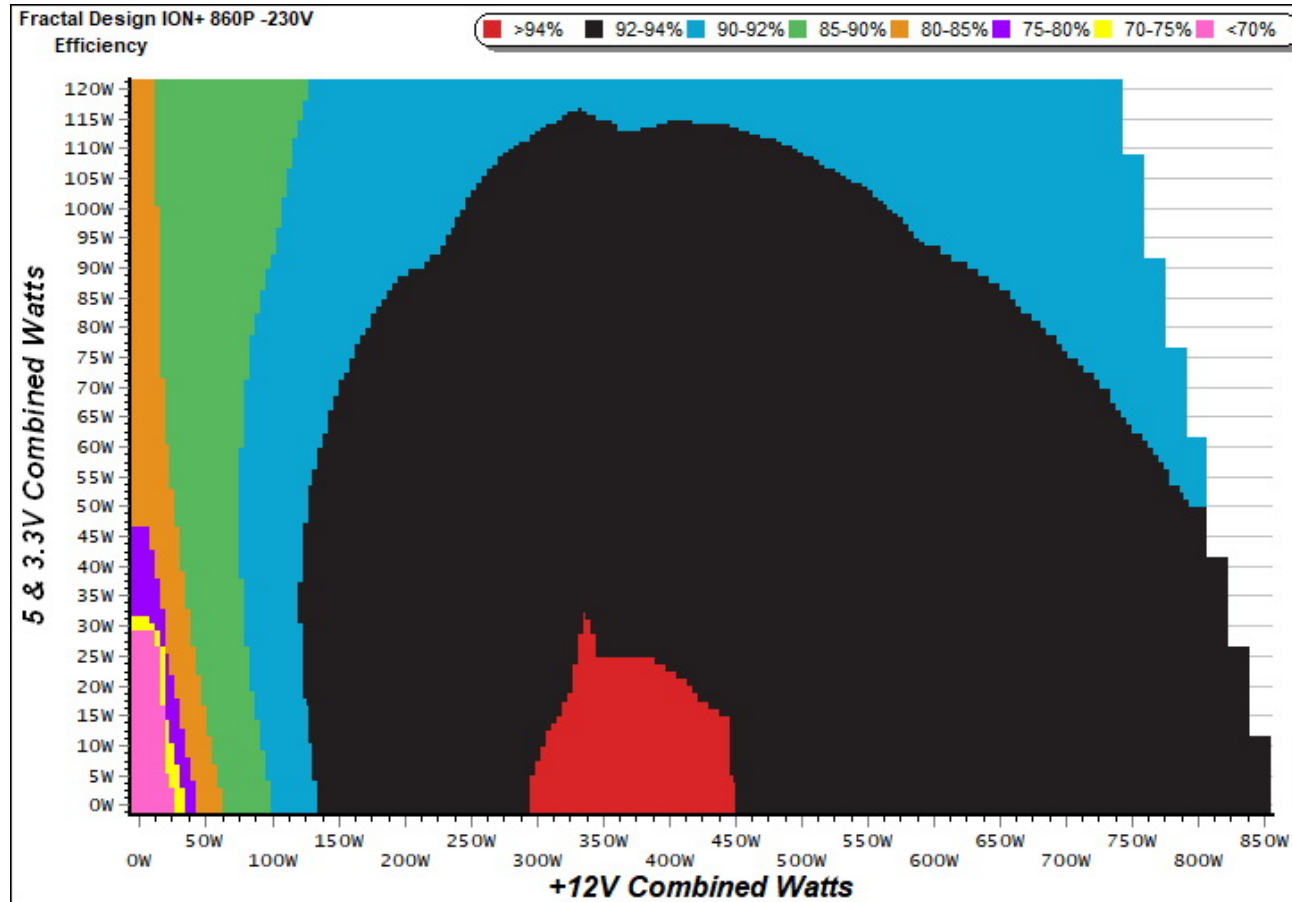
115V



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.

230V

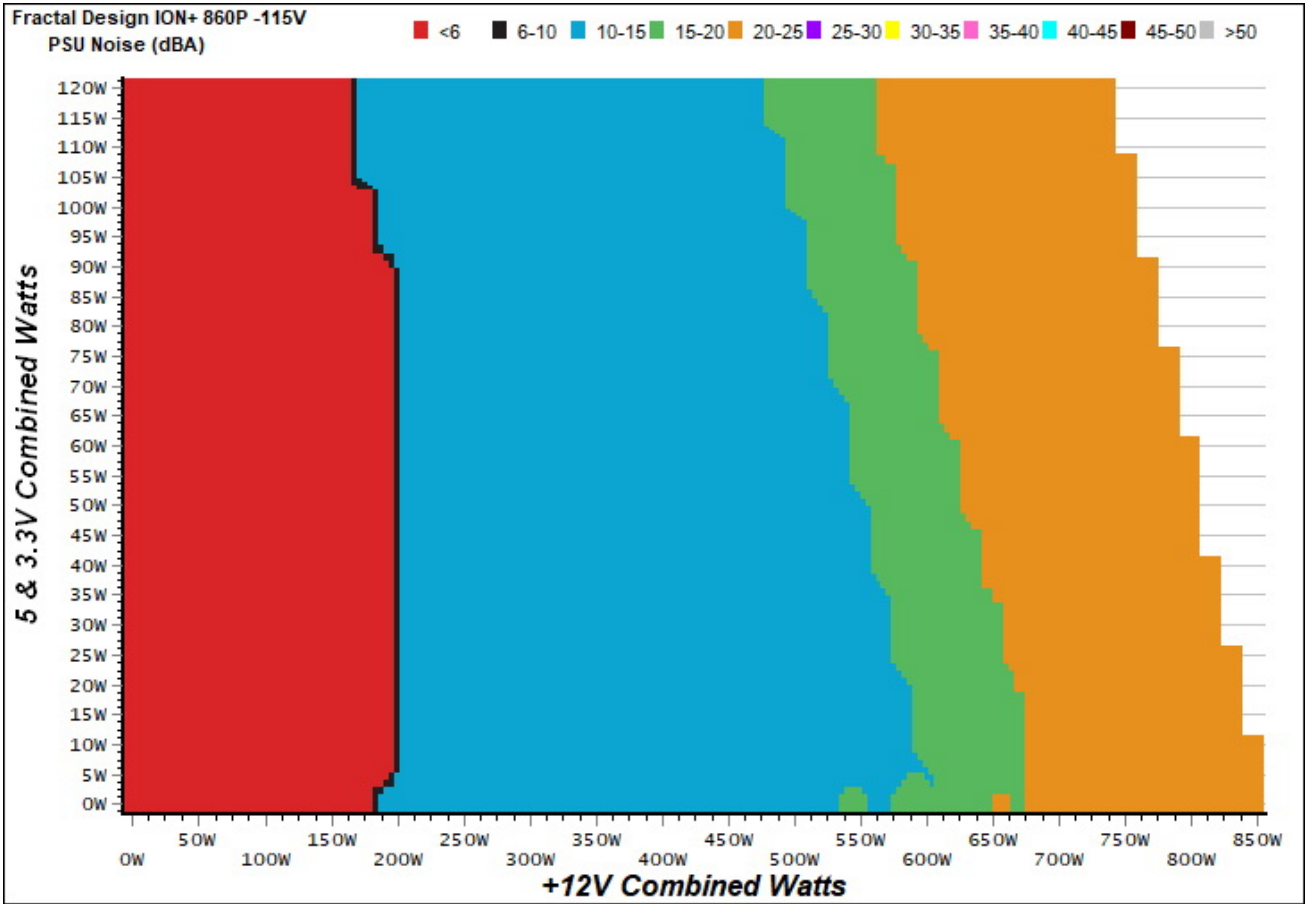


INFO

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

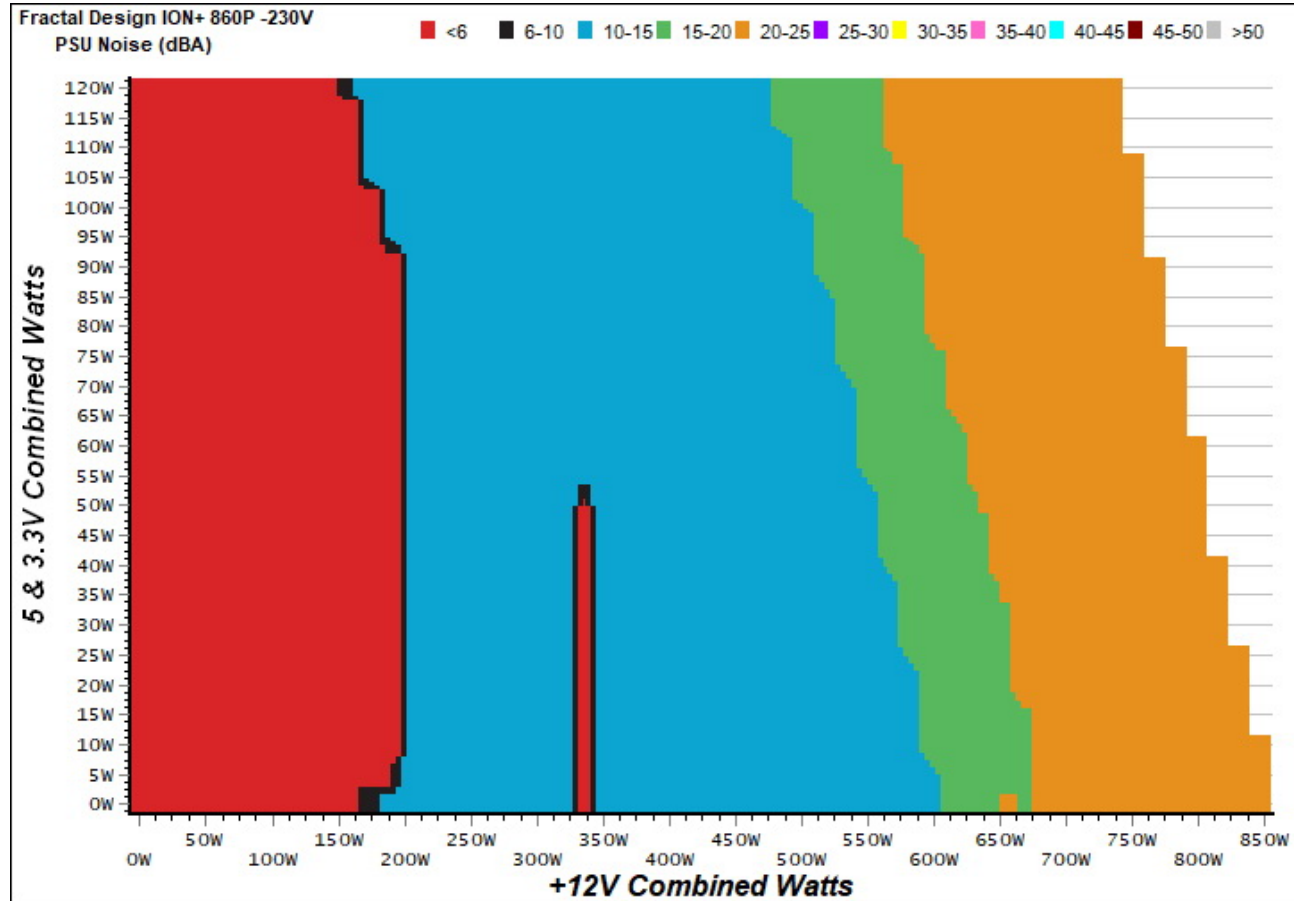
115V



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.

230V



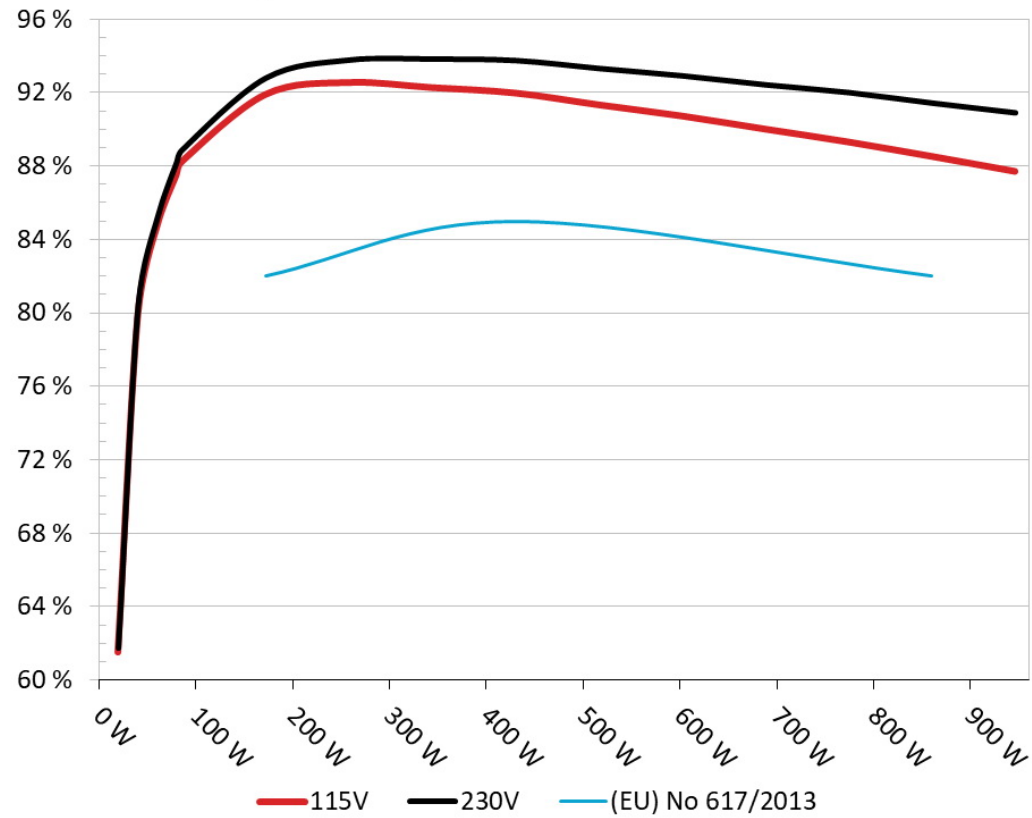
INFO

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

Efficiency: Fractal Design ION+ 860P
Ambient: 37°C - 47°C (98.6°F - 116.6°F)



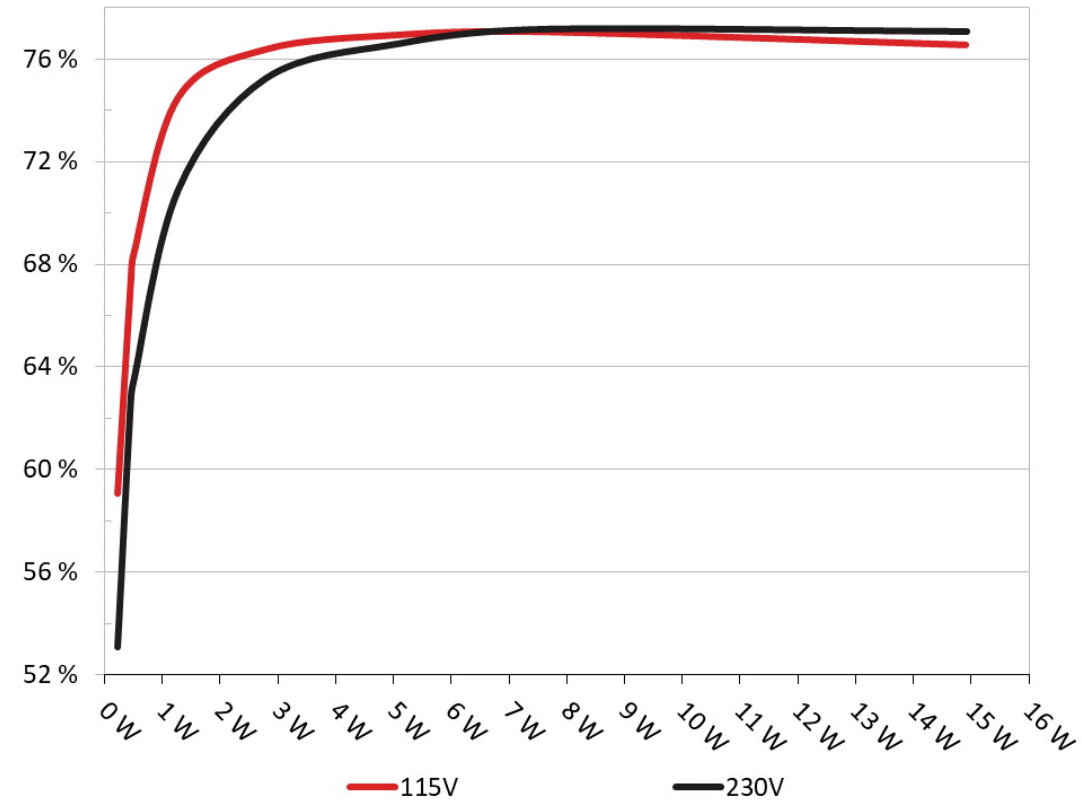
INFO

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

5VSB Efficiency: Fractal Design ION+ 860P

Ambient: 34°C - 36°C (93.2°F - 96.8°F)



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	0.046A	0.231	59.079%	0.247
	5.040V	0.391		115.12V
2	0.090A	0.460	67.350%	0.092
	5.106V	0.683		115.12V
3	0.550A	2.798	76.365%	0.315
	5.086V	3.664		115.12V
4	1.000A	5.067	76.924%	0.392
	5.066V	6.587		115.12V
5	1.500A	7.566	77.047%	0.434
	5.044V	9.820		115.12V
6	3.000A	14.914	76.537%	0.487
	4.971V	19.486		115.12V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.046A	0.231	53.103%	0.102
	5.041V	0.435		230.27V
2	0.090A	0.460	62.756%	0.031
	5.106V	0.733		230.27V
3	0.550A	2.798	75.235%	0.143
	5.085V	3.719		230.27V
4	1.000A	5.066	76.572%	0.221
	5.065V	6.616		230.26V
5	1.500A	7.564	77.144%	0.278
	5.042V	9.805		230.27V
6	3.000A	14.918	77.056%	0.365
	4.972V	19.360		230.27V

Supplementary Tests (For Reference)

Typical Load Tests

115V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
1	5.338A	1.996A	2.004A	1.003A	85.828	88.273%	0	<6.0	43.85°C	0.969
	12.028V	5.016V	3.299V	4.985V	97.230				40.30°C	115.12V
2	11.733A	2.997A	3.009A	1.206A	171.908	91.918%	0	<6.0	45.00°C	0.990
	12.016V	5.011V	3.292V	4.976V	187.023				40.73°C	115.12V
3	18.476A	3.496A	3.497A	1.409A	257.808	92.573%	0	<6.0	46.29°C	0.997
	12.005V	5.008V	3.288V	4.967V	278.492				41.29°C	115.12V
4	25.230A	3.993A	4.008A	1.611A	343.806	92.299%	595	12.5	41.78°C	0.996
	11.993V	5.013V	3.295V	4.966V	372.493				47.71°C	115.12V
5	31.667A	4.997A	5.020A	1.817A	429.928	92.001%	598	12.6	42.31°C	0.997
	11.981V	5.006V	3.288V	4.956V	467.308				49.40°C	115.11V
6	38.112A	6.003A	6.034A	2.022A	516.020	91.359%	602	12.6	42.60°C	0.998
	11.970V	5.001V	3.281V	4.946V	564.825				51.10°C	115.11V
7	44.572A	7.009A	7.056A	2.229A	602.156	90.746%	657	14.6	43.01°C	0.998
	11.959V	4.996V	3.274V	4.936V	663.559				52.44°C	115.11V
8	51.042A	8.019A	8.057A	2.437A	688.273	90.032%	847	22.7	43.99°C	0.998
	11.948V	4.990V	3.277V	4.926V	764.477				53.67°C	115.10V
9	57.932A	8.526A	8.557A	2.438A	773.999	89.333%	972	26.8	44.58°C	0.998
	11.936V	4.987V	3.272V	4.924V	866.424				55.37°C	115.10V
10	64.594A	9.029A	9.090A	3.063A	860.005	88.546%	1332	36.2	45.55°C	0.999
	11.925V	4.986V	3.267V	4.899V	971.250				56.85°C	115.10V
11	71.869A	9.030A	9.095A	3.064A	945.971	87.731%	1705	42.9	46.56°C	0.999
	11.914V	4.985V	3.266V	4.897V	1078.261				58.27°C	115.10V
CL1	0.154A	14.005A	13.999A	0.000A	117.609	83.815%	0	<6.0	49.30°C	0.981
	12.004V	4.994V	3.273V	5.053V	140.319				42.30°C	115.12V

CL2	71.667A	1.002A	1.000A	1.000A	868.900	89.484%	914	24.9	45.51°C	0.999
	11.939V	5.005V	3.287V	4.967V	971.017				56.18°C	115.09V

The results above are not used in the certification process

230V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
1	5.334A	1.996A	2.000A	1.003A	85.758	88.890%	0	<6.0	42.65°C	0.830
	12.027V	5.014V	3.300V	4.984V	96.477				40.01°C	230.25V
2	11.729A	2.990A	3.007A	1.204A	171.831	92.788%	0	<6.0	43.71°C	0.927
	12.015V	5.019V	3.292V	4.985V	185.187				40.67°C	230.25V
3	18.471A	3.497A	3.498A	1.410A	257.747	93.769%	0	<6.0	44.63°C	0.959
	12.004V	5.007V	3.290V	4.967V	274.873				41.19°C	230.26V
4	25.225A	4.001A	4.017A	1.615A	343.745	93.824%	591	12.5	41.81°C	0.970
	11.993V	5.003V	3.286V	4.956V	366.372				45.50°C	230.25V
5	31.666A	4.998A	5.017A	1.817A	429.885	93.747%	596	12.5	42.27°C	0.980
	11.980V	5.006V	3.289V	4.956V	458.561				46.27°C	230.26V
6	38.111A	6.001A	6.035A	2.023A	515.980	93.315%	602	12.6	42.76°C	0.984
	11.969V	5.002V	3.282V	4.946V	552.947				47.70°C	230.25V
7	44.573A	7.009A	7.056A	2.229A	602.126	92.911%	657	14.6	43.09°C	0.987
	11.958V	4.996V	3.274V	4.936V	648.066				49.01°C	230.25V
8	51.051A	8.017A	8.056A	2.437A	688.262	92.423%	848	22.7	43.58°C	0.991
	11.946V	4.990V	3.277V	4.925V	744.690				50.17°C	230.25V
9	57.935A	8.526A	8.558A	2.438A	773.988	92.000%	917	24.9	44.70°C	0.994
	11.935V	4.987V	3.273V	4.924V	841.287				52.01°C	230.26V
10	64.599A	9.027A	9.093A	3.063A	860.011	91.427%	1335	36.2	45.56°C	0.996
	11.924V	4.987V	3.267V	4.900V	940.652				53.28°C	230.26V
11	71.876A	9.031A	9.097A	3.064A	945.983	90.899%	1710	43.0	46.72°C	0.996
	11.913V	4.985V	3.265V	4.897V	1040.696				55.02°C	230.26V
CL1	0.149A	14.005A	14.002A	0.000A	117.613	84.414%	0	<6.0	46.71°C	0.886
	12.003V	4.996V	3.275V	5.054V	139.328				41.97°C	230.27V

CL2	71.680A	1.003A	1.003A	1.000A	868.838	92.014%	1327	36.1	45.61°C	0.996
	11.936V	4.997V	3.286V	4.958V	944.241				53.69°C	230.27V

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)	PSU Noise (dB[A])	PF/AC Volts
1	1.208A	0.500A	0.483A	0.200A	19.724	61.509%	0	<6.0	0.866
	12.097V	5.021V	3.307V	5.015V	32.067				115.13V
2	2.479A	0.999A	1.000A	0.400A	40.142	79.853%	0	<6.0	0.925
	12.032V	5.016V	3.302V	5.004V	50.270				115.12V
3	3.675A	1.499A	1.488A	0.601A	59.620	84.684%	0	<6.0	0.949
	12.028V	5.011V	3.296V	4.994V	70.403				115.12V
4	4.939A	1.996A	2.001A	0.801A	80.021	87.555%	0	<6.0	0.966
	12.028V	5.016V	3.300V	4.993V	91.395				115.13V

The results above are not used in the certification process

230V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.201A	0.498A	0.485A	0.199A	19.630	61.733%	0	<6.0	0.533
	12.092V	5.029V	3.306V	5.024V	31.798				230.25V
2	2.472A	0.998A	1.000A	0.400A	40.050	80.388%	0	<6.0	0.651
	12.031V	5.015V	3.303V	5.003V	49.821				230.25V
3	3.669A	1.497A	1.483A	0.601A	59.534	85.109%	0	<6.0	0.751
	12.027V	5.015V	3.302V	4.998V	69.950				230.25V
4	4.933A	1.995A	1.999A	0.801A	79.937	88.215%	0	<6.0	0.818
	12.028V	5.015V	3.301V	4.993V	90.616				230.25V

The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	11.9 mV	7.2 mV	10.3 mV	9.4 mV	Pass
20% Load	9.6 mV	8.0 mV	9.7 mV	10.5 mV	Pass
30% Load	10.4 mV	9.7 mV	10.6 mV	12.0 mV	Pass
40% Load	13.7 mV	8.9 mV	10.5 mV	13.2 mV	Pass
50% Load	12.8 mV	9.8 mV	11.4 mV	14.8 mV	Pass
60% Load	14.2 mV	10.3 mV	12.8 mV	15.5 mV	Pass
70% Load	15.6 mV	11.3 mV	13.5 mV	16.2 mV	Pass
80% Load	16.8 mV	11.9 mV	13.3 mV	16.8 mV	Pass
90% Load	17.8 mV	12.1 mV	12.8 mV	16.4 mV	Pass
100% Load	22.4 mV	13.1 mV	16.1 mV	18.4 mV	Pass
110% Load	23.6 mV	14.5 mV	15.5 mV	19.7 mV	Pass
Crossload 1	16.2 mV	9.2 mV	12.8 mV	11.0 mV	Pass
Crossload 2	5.4 mV	5.3 mV	7.0 mV	12.8 mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	11.4 mV	8.0 mV	10.5 mV	9.4 mV	Pass
20% Load	8.6 mV	8.4 mV	10.9 mV	9.8 mV	Pass
30% Load	9.0 mV	10.5 mV	11.4 mV	11.2 mV	Pass
40% Load	10.3 mV	9.8 mV	11.8 mV	11.7 mV	Pass
50% Load	12.5 mV	27.7 mV	33.8 mV	25.0 mV	Pass
60% Load	12.5 mV	11.4 mV	13.8 mV	13.1 mV	Pass
70% Load	13.5 mV	12.0 mV	13.4 mV	13.8 mV	Pass
80% Load	15.2 mV	11.9 mV	13.9 mV	14.6 mV	Pass

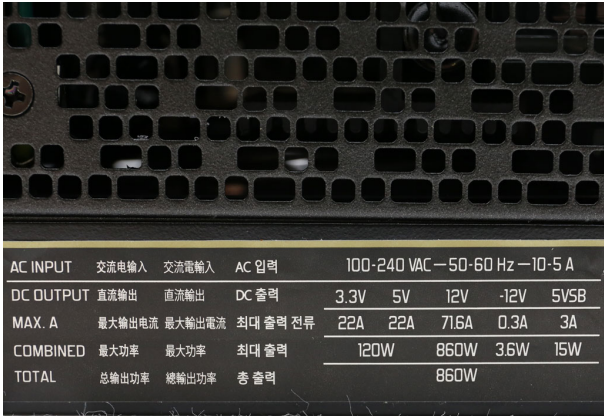
Test	12V	5V	3.3V	5VSB	Pass/Fail
90% Load	15.1 mV	12.9 mV	14.9 mV	14.7 mV	Pass
100% Load	19.8 mV	13.2 mV	15.2 mV	17.0 mV	Pass
110% Load	21.0 mV	13.7 mV	16.8 mV	17.4 mV	Pass
Crossload 1	15.7 mV	10.0 mV	13.1 mV	10.8 mV	Pass
Crossload 2	19.7 mV	12.8 mV	14.3 mV	16.2 mV	Pass

The results above are not used in the certification process

Fractal Design ION+ 860P



Top side



Power specifications label

Cybenetics [REDACTED] ETA[REDACTED] LAMBDA[REDACTED] SAFE[REDACTED] DELTA[REDACTED] PHI[REDACTED]