FSP Technology Hydro G Pro 850W

Serial Number S9131000005

Lab ID FS19850065

Certification ID 25756

Test Result Report ID:

Certificate Issue Date: Jul 16, 2019

Scheme: ETA-EMI PSU

115V



230V



Scheme: LAMBDA PSU

115V



230V





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	FSP Technology
Model	Hydro G Pro 850W
OEM/ODM	FSP
Serial Number	S9131000005
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	11-5.5
Rated Frequency (Hz)	50-60

Rated Power (W)	850
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 (MGA12012XF-O25)
Semi-Passive Operation	✓ (selectable)
Cybenetics Testing Information	
Lab ID	FS19850065
Date of receipt	Jan 7, 2019
Testing Date	May 7, 2019
Report Issued Date	Jul 16, 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	18-22AWG	No
4+4 pin EPS12V (700mm)	2	2	18AWG	No
6+2 pin PCIe (650mm+150mm)	1	2	18AWG	No
6+2 pin PCIe (500mm+150mm)	2	4	18AWG	No
SATA (520mm+150mm+150mm+150mm)	1	4	18AWG	No
SATA (500mm+150mm+150mm+150mm)	1	4	18AWG	No
SATA (500mm+150mm) / 4 pin Molex (+150mm+100mm)	2	4 / 4	18AWG	No
SATA (500mm+150mm) / 4 pin Molex (+150mm) / FDD (+150mm)	1	2 / 1 / 1	18-22AWG	No

AC Power Cord (1370mm) - C13 coupler	1	1	18AWG	-

Power Specifications

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	20	20	70.83	2.5	0.3
	Watts	120		850	12.5	3.6
Total Max. Power (W)		850				

Parts Description

General Data	
Manufacturer (OEM)	FSP
PCB Type	Double Sided
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV, 2x Gas Discharge Tubes
Inrush Protection	NTC Thermistor & Relay
Bridge Rectifier(s)	2x HY GBJ2506 (600V, 25A @ 100°C)
APFC MOSFETS	2x Infineon IPA60R180P7 (650V, 11A @ 100°C, 0.18Ohm)
APFC Boost Diode	1x STMicroelectronics STPSC6H065 (650V, 6A @ 110°C)
Hold-up Cap(s)	1x Nippon Chemi-Con(450V, 680uF, 3,000h @ 105°C, KHS)
Main Switchers	2x STMicroelectronics STF28N60M2 (650V, 14A @ 100°C, 0.15Ohm)
APFC Controller	Infineon ICE2PCS02
Resonant Controllers	Champion CM6901T2X
Topology	Primary side: Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETS	4x Toshiba TPHR8504PL (40V, 150A @ 25°C, 0.85mOhm)
5V & 3.3V	DC-DC Converters:6x Diodes Incorporated DMN3009SK3 (30V, 60A @ 70°C, 5.5mOhm) PWM Controllers: ANPEC APW7159C
Filtering Capacitors	Electrolytics: 5x Nippon Chemi-Con (1-5,000h @ 105°C, KZE), 1x Rubycon (3-6,000h @ 105°C, YXG), 5x Rubycon (6-10,000h @ 105°C, ZLH), 2x Rubycon (6-10,000h @ 105°C, ZLJ) Polymers: 30x United Chemi-Con
Supervisor IC	SITI PS223H (OCP, OTP, OVP, UVP, SCP, PG)
Fan Model	Protechnic Electric MGA12012XF-O25(120mm, 12V, 0.52A, Fluid Dynamic Fan)

Fan Controller	APW9010
5VSB Circuit	
Rectifier	CET CEF04N7G FET(700V, 4A @ 25°C, 3.3Ohm) & PFC P15L50SP SBR(50V, 15A)
Standby PWM Controller	-

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)	88.995%
Average Noise Output (>1450 Load Combinations)	34.29dBA
Average PF (>1450 Load Combinations)	0.992
Efficiency With 10W (≤500W) or 2% (>500W) Load	65.613%
Standby Power Consumption	0.0751W
Non-Accredited	
12V Ripple (Full Load)	25.72mV
5V Ripple (Full Load)	19.49mV
3.3V Ripple (Full Load)	28.27mV
5VSB Ripple (Full Load)	15.48mV
12V Load Regulation	1.16%
5V Load Regulation	0.83%
3.3V Load Regulation	1.40%
5VSB Load Regulation	2.58%
Inrush Current	41.157A

230V		
Accredited		
Average Efficiency (>1450 load combinations)	91.133%	
Average Noise Output (>1450 Load Combinations)	33.54dBA	
Average PF (>1450 Load Combinations)	0.963	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.1726W	
Non-Accredited		
12V Ripple (Full Load)	25.04mV	
5V Ripple (Full Load)	18.87mV	
3.3V Ripple (Full Load)	27.20mV	
5VSB Ripple (Full Load)	13.13mV	
12V Load Regulation	1.13%	
5V Load Regulation	0.81%	
3.3V Load Regulation	1.46%	
5VSB Load Regulation	2.57%	
Inrush Current	83.739A	
Hold-Up Time & PWR_OK Signal	17.10ms	
AC Loss to PWR_OK Hold Up Time	13.70ms	
PWR_OK Inactive to DC Loss Delay	3.40ms	
OPP (0.00°C / 0.00°C)	120.50%	-

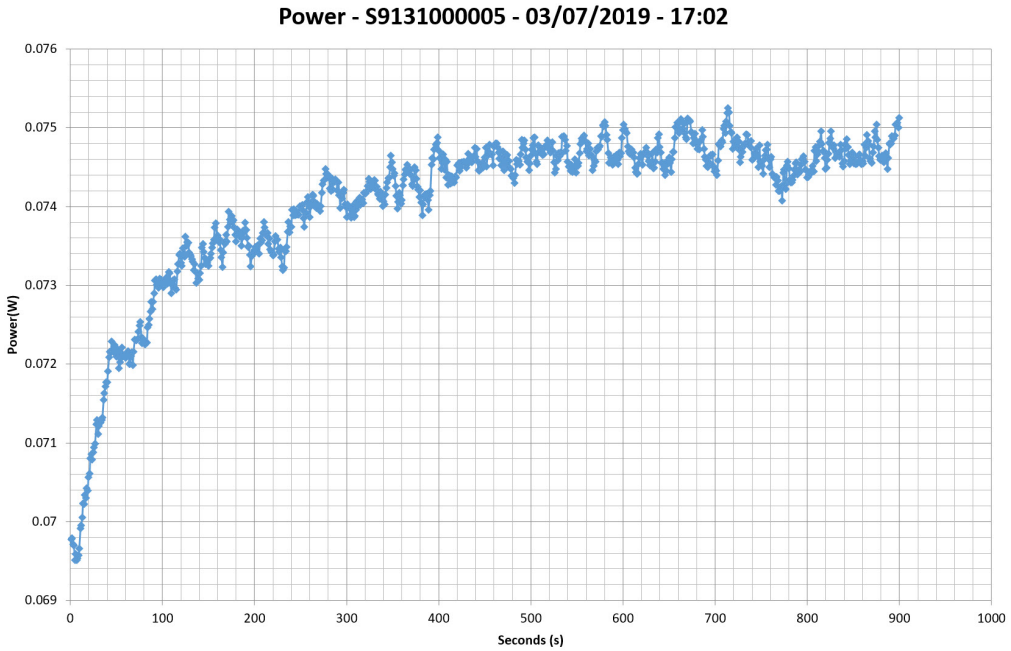
Hold-Up Time & PWR_OK Signal

Hold-Up Time (ms)	17.1
AC Loss to PWR_OK Hold Up Time (ms)	13.7
PWR_OK Inactive to DC Loss Delay (ms)	3.4

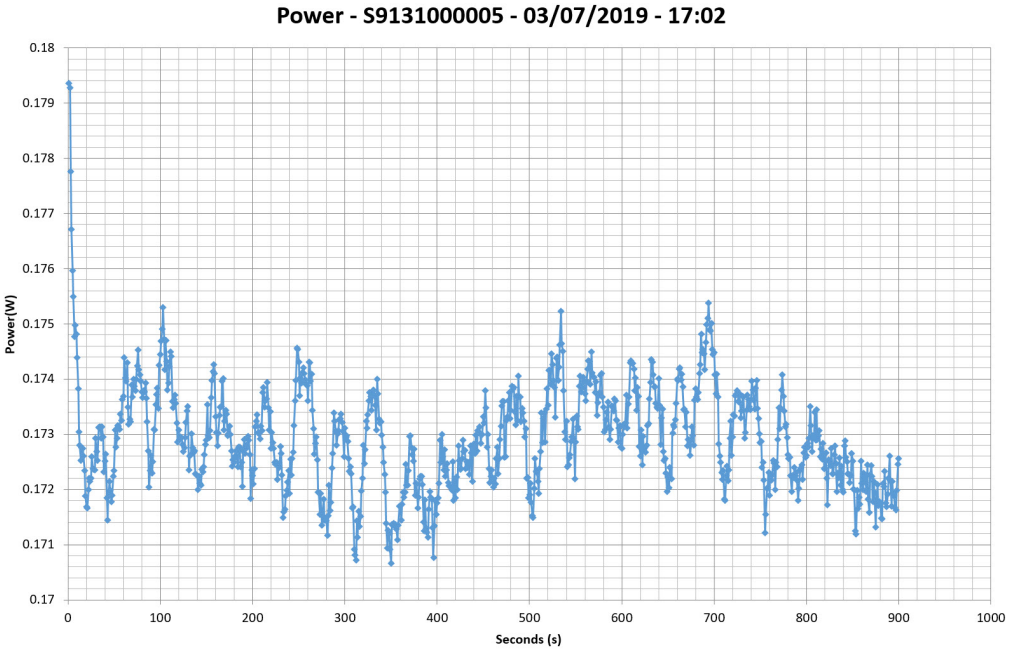
Vampire Power

Graphs

115V

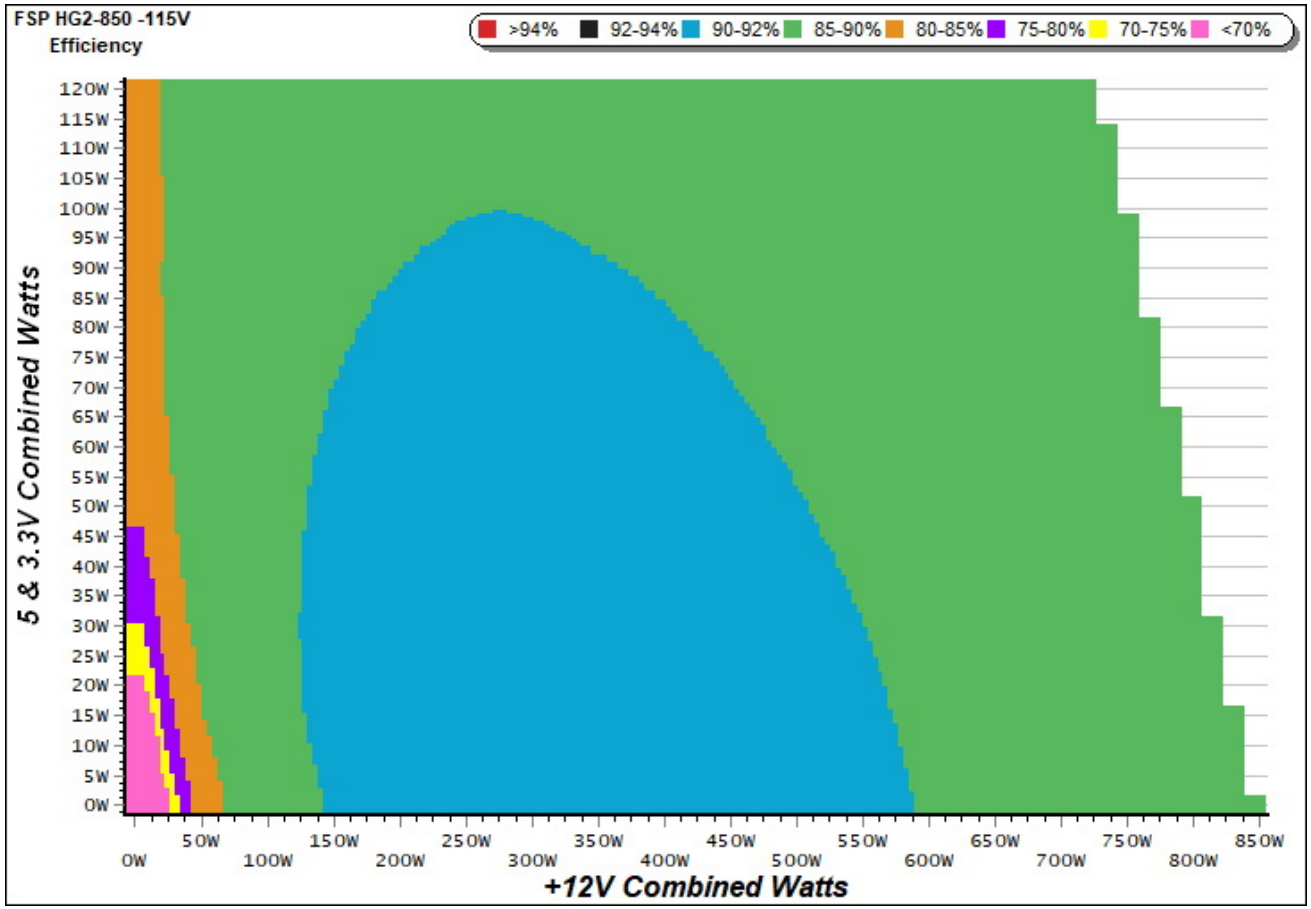


230V



Efficiency Graph

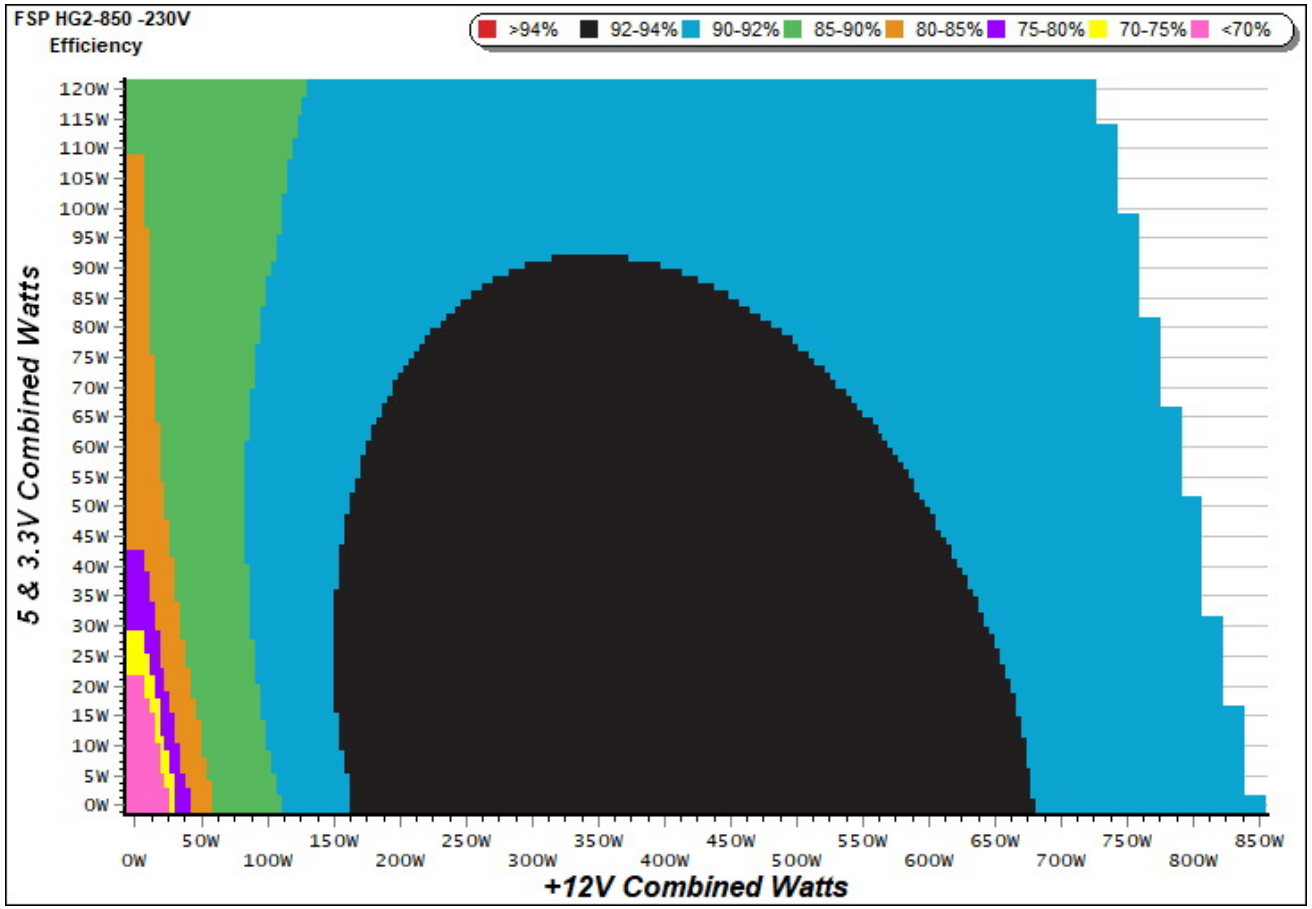
115V



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

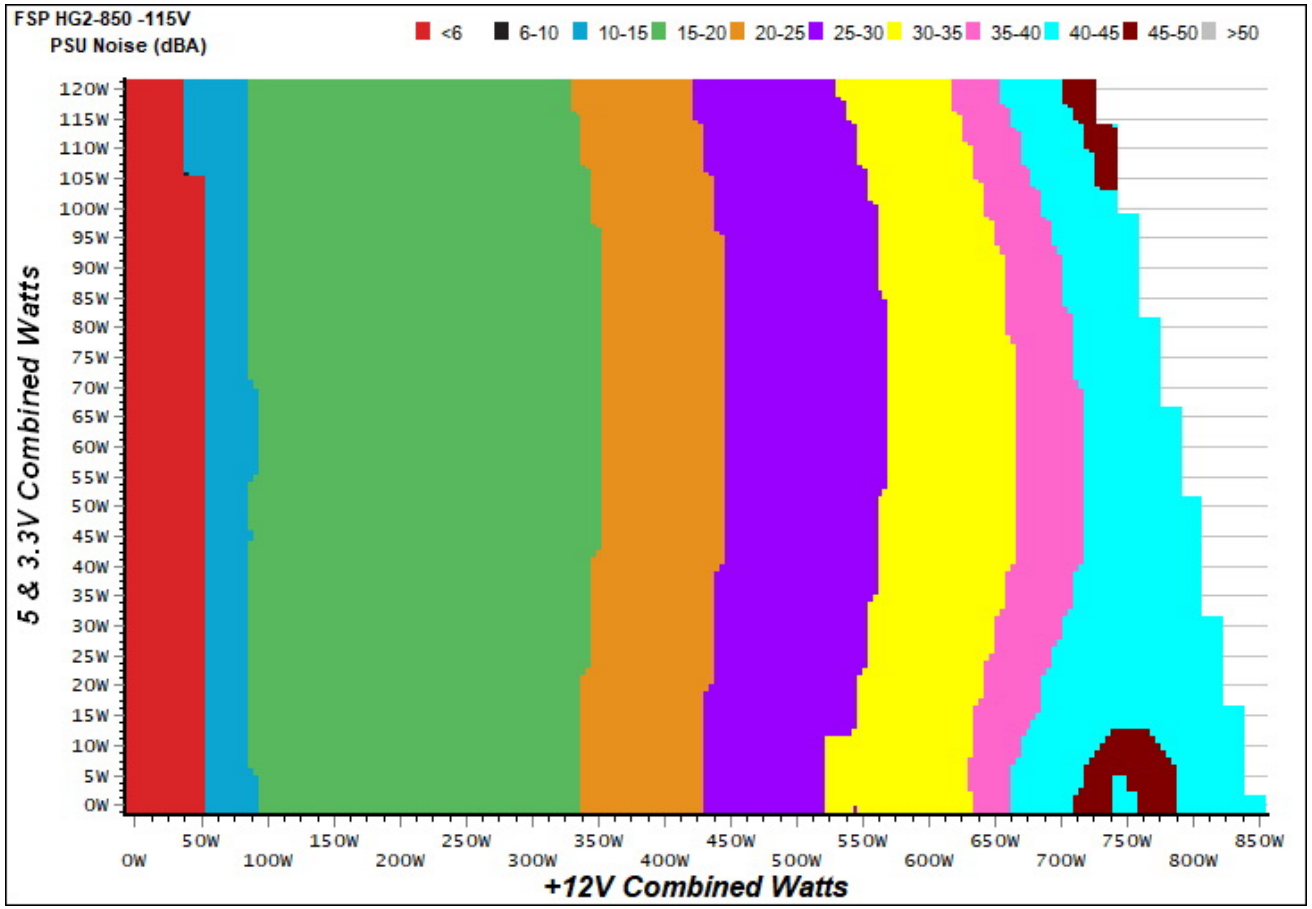


INFO

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

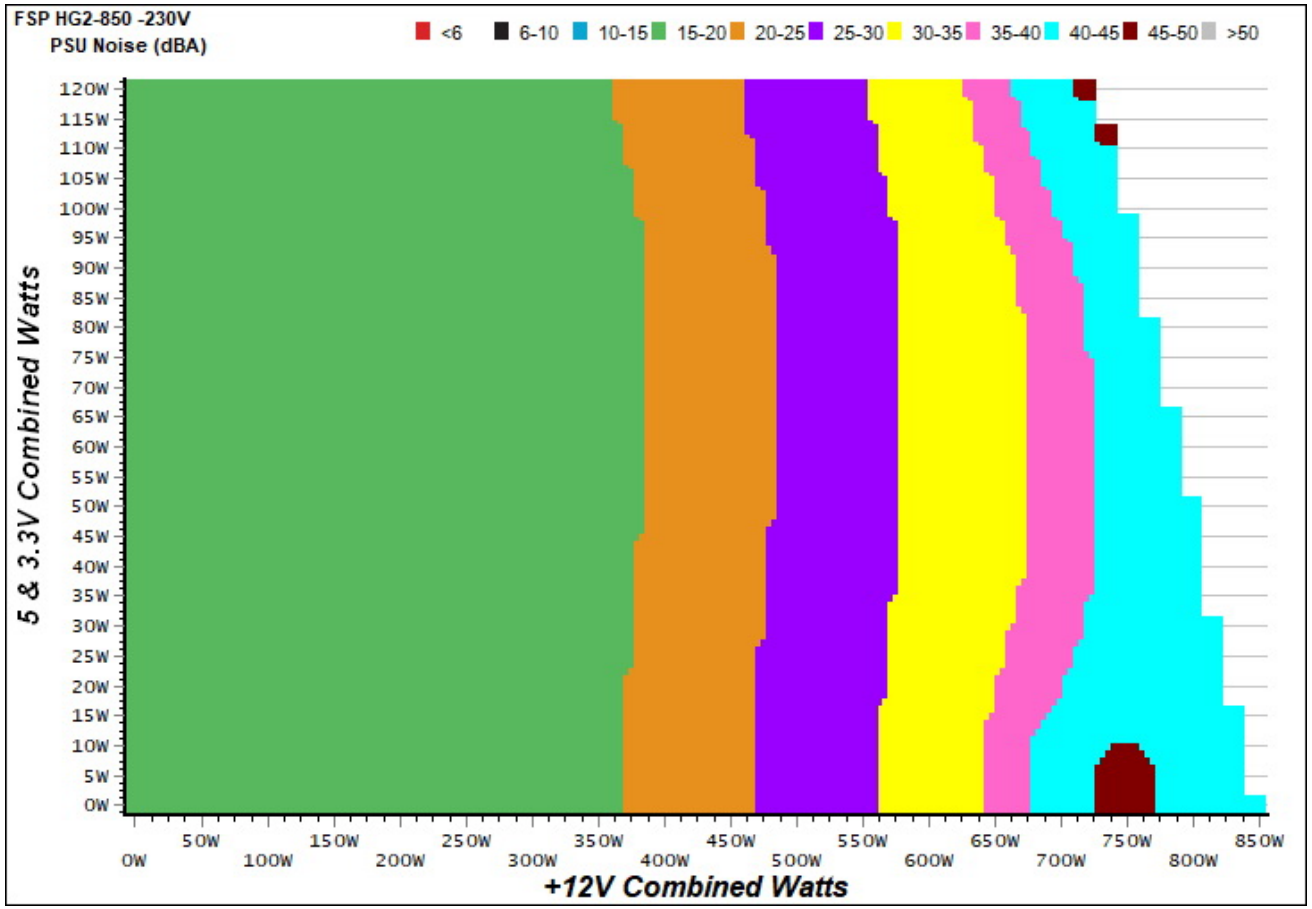
115V



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

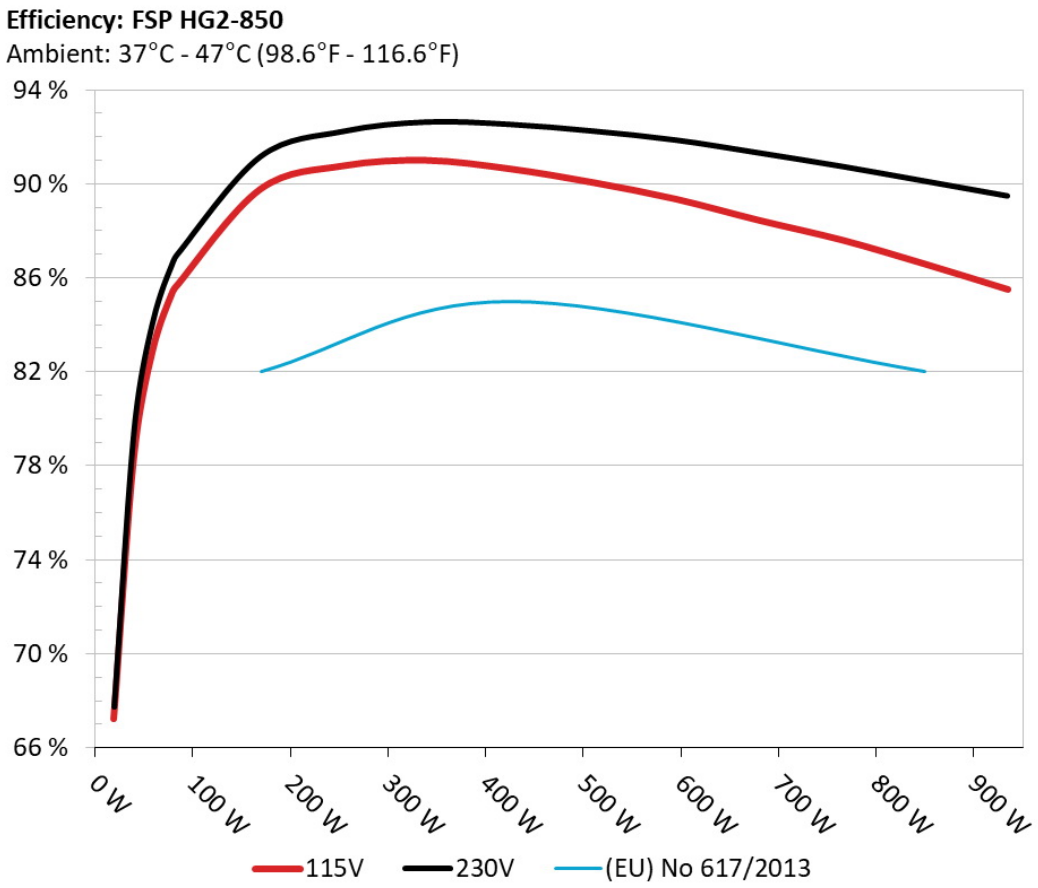


INFO

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

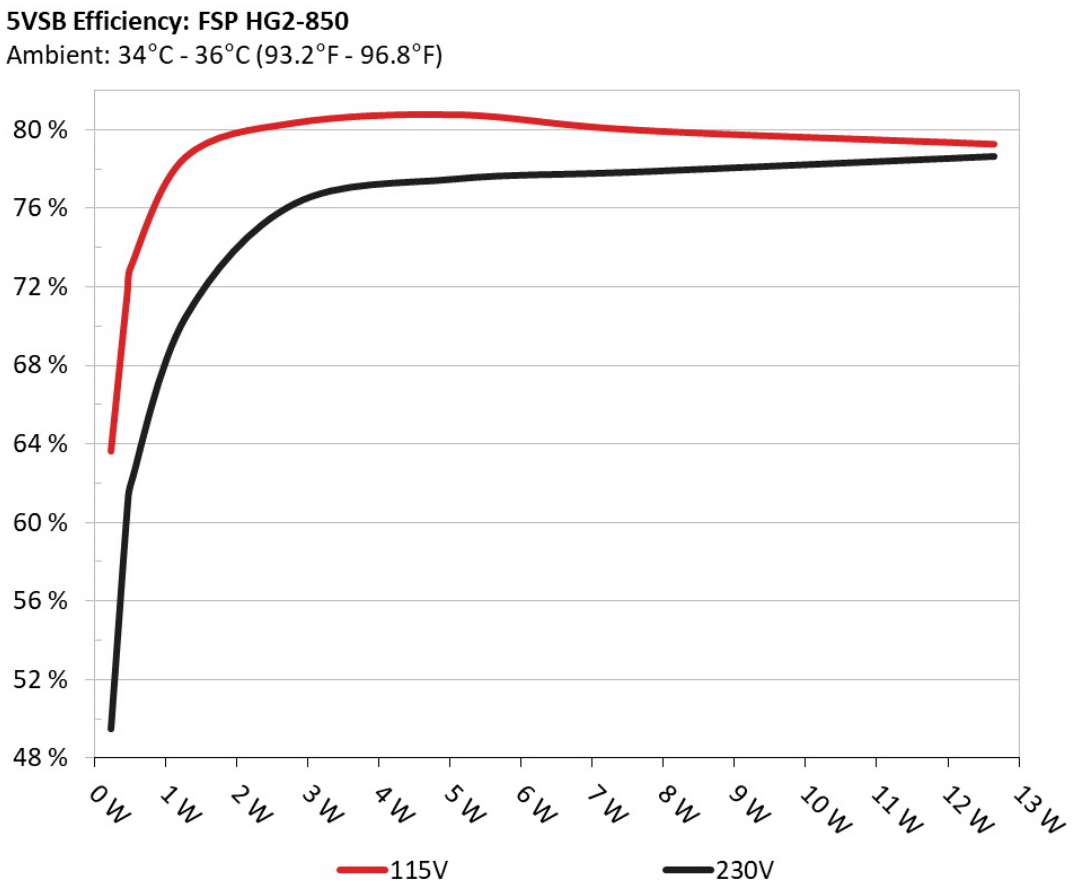
Efficiency under high ambient temperature



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	0.045A	0.231	63.636%	0.036
	5.117V	0.363		115.12V
2	0.090A	0.461	71.695%	0.060
	5.115V	0.643		115.12V
3	0.550A	2.808	80.343%	0.253
	5.104V	3.495		115.12V
4	1.000A	5.096	80.761%	0.346
	5.095V	6.310		115.12V
5	1.500A	7.627	79.981%	0.403
	5.084V	9.536		115.12V
6	2.501A	12.656	79.263%	0.458
	5.061V	15.967		115.12V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.231	49.465%	0.014
	5.116V	0.467		230.27V
2	0.090A	0.461	60.738%	0.022
	5.115V	0.759		230.27V
3	0.550A	2.808	76.242%	0.101
	5.104V	3.683		230.27V
4	1.000A	5.096	77.517%	0.168
	5.095V	6.574		230.27V
5	1.500A	7.627	77.874%	0.225
	5.084V	9.794		230.27V
6	2.500A	12.657	78.664%	0.302
	5.062V	16.090		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	5.243A	1.976A	1.969A	0.983A	84.935	85.698%	729	15.6	40.16°C	0.978
	12.079V	5.063V	3.353V	5.085V	99.110				42.86°C	115.11V
2	11.482A	2.967A	2.956A	1.183A	169.430	89.753%	734	15.6	40.40°C	0.994
	12.064V	5.059V	3.349V	5.072V	188.774				43.59°C	115.11V
3	18.133A	3.463A	3.437A	1.383A	254.523	90.747%	752	16.2	41.40°C	0.994
	12.051V	5.055V	3.345V	5.061V	280.474				45.15°C	115.11V
4	24.798A	3.961A	3.949A	1.585A	339.720	90.982%	861	21.6	41.90°C	0.995
	12.038V	5.051V	3.341V	5.048V	373.393				46.23°C	115.11V
5	31.146A	4.958A	4.948A	1.788A	425.026	90.618%	975	24.8	42.14°C	0.995
	12.024V	5.046V	3.336V	5.035V	469.032				47.44°C	115.10V
6	37.450A	5.952A	5.944A	1.992A	509.553	90.041%	1106	29.8	42.80°C	0.995
	12.009V	5.042V	3.331V	5.023V	565.912				48.91°C	115.10V
7	43.835A	6.952A	6.947A	2.197A	594.877	89.335%	1283	33.1	43.02°C	0.995
	11.994V	5.037V	3.325V	5.009V	665.897				49.38°C	115.10V
8	50.241A	7.952A	7.952A	2.403A	680.208	88.428%	1801	48.6	43.74°C	0.994
	11.978V	5.032V	3.320V	4.996V	769.221				50.76°C	115.10V
9	57.059A	8.456A	8.446A	2.407A	765.124	87.592%	2273	48.0	44.76°C	0.993
	11.963V	5.028V	3.316V	4.987V	873.509				52.02°C	115.09V
10	63.835A	8.961A	8.973A	2.512A	849.797	86.574%	2745	53.5	45.52°C	0.992
	11.946V	5.024V	3.310V	4.977V	981.587				53.55°C	115.10V
11	71.021A	8.966A	8.985A	2.516A	934.567	85.498%	2752	53.6	46.94°C	0.991
	11.931V	5.021V	3.305V	4.969V	1093.091				55.60°C	115.09V
CL1	0.143A	14.005A	13.998A	0.000A	118.868	83.465%	1075	28.0	42.30°C	0.989
	12.066V	5.040V	3.326V	5.088V	142.417				47.82°C	115.11V

CL2	70.842A	1.001A	1.000A	1.000A	860.380	87.028%	2613	51.8	45.27°C	0.992
	11.956V	5.040V	3.327V	5.021V	988.620				53.80°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	5.248A	1.977A	1.969A	0.984A	84.999	87.050%	730	15.6	40.42°C	0.858
	12.078V	5.063V	3.352V	5.084V	97.644				42.85°C	230.26V
2	11.488A	2.967A	2.960A	1.183A	169.492	91.177%	736	15.7	40.72°C	0.943
	12.063V	5.058V	3.346V	5.072V	185.894				43.77°C	230.26V
3	18.139A	3.464A	3.442A	1.384A	254.575	92.254%	770	17.4	41.43°C	0.968
	12.049V	5.055V	3.342V	5.060V	275.950				44.82°C	230.25V
4	24.805A	3.962A	3.957A	1.585A	339.774	92.651%	883	21.3	41.90°C	0.978
	12.036V	5.051V	3.338V	5.048V	366.725				45.84°C	230.25V
5	31.157A	4.956A	4.952A	1.788A	425.085	92.547%	986	25.7	42.14°C	0.982
	12.022V	5.046V	3.333V	5.035V	459.317				46.71°C	230.25V
6	37.460A	5.954A	5.952A	1.992A	509.602	92.266%	1101	29.1	42.44°C	0.984
	12.007V	5.041V	3.327V	5.022V	552.317				47.99°C	230.25V
7	43.843A	6.952A	6.956A	2.197A	594.929	91.882%	1290	33.6	43.11°C	0.984
	11.993V	5.037V	3.321V	5.008V	647.494				49.25°C	230.26V
8	50.245A	7.952A	7.965A	2.403A	680.256	91.333%	1759	44.3	43.59°C	0.982
	11.978V	5.032V	3.315V	4.995V	744.811				50.60°C	230.26V
9	57.068A	8.458A	8.460A	2.407A	765.181	90.760%	2267	48.0	44.69°C	0.980
	11.962V	5.027V	3.311V	4.987V	843.085				52.56°C	230.26V
10	63.840A	8.962A	8.984A	2.513A	849.863	90.133%	2744	53.4	45.75°C	0.978
	11.946V	5.024V	3.306V	4.976V	942.899				54.15°C	230.26V
11	71.027A	8.968A	8.993A	2.517A	934.651	89.504%	2753	53.6	46.75°C	0.977
	11.931V	5.021V	3.302V	4.968V	1044.257				55.65°C	230.26V
CL1	0.153A	14.004A	13.999A	0.000A	118.931	84.758%	1190	32.0	42.12°C	0.917
	12.067V	5.039V	3.323V	5.087V	140.319				46.91°C	230.26V

CL2	70.854A	1.002A	1.000A	1.000A	860.527	90.554%	2631	52.0	45.26°C	0.978
	11.956V	5.040V	3.326V	5.020V	950.287				53.92°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	1.196A	0.494A	0.476A	0.196A	19.563	67.255%	0	<6.0	0.873
	12.090V	5.068V	3.359V	5.109V	29.088				115.12V
2	2.458A	0.988A	0.981A	0.392A	40.006	78.336%	718	15.2	0.943
	12.086V	5.066V	3.357V	5.103V	51.070				115.11V
3	3.649A	1.482A	1.461A	0.589A	59.500	82.928%	722	15.3	0.966
	12.083V	5.064V	3.355V	5.096V	71.749				115.12V
4	4.910A	1.976A	1.966A	0.786A	79.907	85.409%	726	15.4	0.978
	12.079V	5.063V	3.354V	5.090V	93.558				115.12V

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	1.204A	0.495A	0.475A	0.196A	19.658	67.737%	723	15.3	0.501
	12.088V	5.067V	3.357V	5.109V	29.021				230.26V
2	2.463A	0.991A	0.985A	0.392A	40.088	79.541%	724	15.3	0.687
	12.085V	5.066V	3.352V	5.103V	50.399				230.26V
3	3.656A	1.483A	1.460A	0.589A	59.576	84.194%	726	15.4	0.780
	12.081V	5.064V	3.354V	5.096V	70.760				230.26V
4	4.915A	1.976A	1.971A	0.786A	79.974	86.708%	728	15.5	0.844
	12.078V	5.063V	3.352V	5.089V	92.234				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	13.7 mV	8.4 mV	15.8 mV	8.9 mV	Pass
20% Load	12.6 mV	7.8 mV	16.7 mV	9.0 mV	Pass
30% Load	12.7 mV	8.7 mV	17.4 mV	9.6 mV	Pass
40% Load	12.7 mV	9.8 mV	18.7 mV	9.7 mV	Pass
50% Load	13.1 mV	11.2 mV	20.8 mV	10.1 mV	Pass
60% Load	14.5 mV	11.4 mV	21.9 mV	11.1 mV	Pass
70% Load	14.3 mV	12.7 mV	23.4 mV	11.6 mV	Pass
80% Load	15.0 mV	14.9 mV	24.6 mV	12.8 mV	Pass
90% Load	15.9 mV	18.7 mV	26.6 mV	12.8 mV	Pass
100% Load	25.7 mV	19.5 mV	28.3 mV	15.5 mV	Pass
110% Load	26.8 mV	19.8 mV	29.9 mV	16.2 mV	Pass
Crossload 1	18.7 mV	11.4 mV	19.0 mV	20.1 mV	Pass
Crossload 2	25.3 mV	13.5 mV	26.8 mV	14.3 mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	14.1 mV	8.5 mV	16.9 mV	8.7 mV	Pass
20% Load	12.1 mV	7.6 mV	16.1 mV	8.8 mV	Pass
30% Load	11.4 mV	8.4 mV	17.3 mV	9.2 mV	Pass
40% Load	12.0 mV	10.0 mV	18.8 mV	9.3 mV	Pass
50% Load	13.5 mV	10.8 mV	19.6 mV	9.8 mV	Pass
60% Load	13.6 mV	10.3 mV	21.5 mV	10.4 mV	Pass
70% Load	14.4 mV	11.4 mV	23.3 mV	10.6 mV	Pass
80% Load	15.0 mV	13.6 mV	24.1 mV	11.5 mV	Pass

Test	12V	5V	3.3V	5VSB	Pass/Fail
90% Load	15.7 mV	17.7 mV	24.8 mV	11.8 mV	Pass
100% Load	25.0 mV	18.9 mV	27.2 mV	13.1 mV	Pass
110% Load	26.3 mV	19.3 mV	30.2 mV	13.4 mV	Pass
Crossload 1	17.4 mV	11.5 mV	20.2 mV	20.0 mV	Pass
Crossload 2	24.5 mV	12.4 mV	26.2 mV	11.8 mV	Pass

The results above are not used in the certification process

FSP Technology Hydro G Pro 850W



Top side



Power specifications table

All data and graphs included in this test report can be used by any individual on the following conditions:
› It should be mentioned that the test results are provided by Cybenetics
› The link to the original test results document should be provided in any case

Cybenetics runs voluntary certification programs for power supplies - ETA for efficiency, LAMBDA for noise and SAFE for safety and correct operation - and for cooling products, with DELTA for chassis soundproofing and PHI for fan airflow and static pressure. THETA rates cooler performance on AMD AM5 and Intel LGA1851 outside ISO 17065 and accreditation scope

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