Anex

FSP Technology Inc. Hydro G Pro 1000W

Lab ID#: FS10002078
Receipt Date: Sep 28, 2022
Test Date: Oct 18, 2022

Report: 22PS2078A
Report Date: Oct 18, 2022

DUT INFORMATION

Brand	FSP Technology Inc.
Manufacturer (OEM)	FSP
Series	Hydro G Pro
Model Number	HG2-1000
Serial Number	S2271000388
DUT Notes	

DUT SPECIFICATIONS

Rated Voltage (Vrms)	100-240
Rated Current (Arms)	12-6
Rated Frequency (Hz)	50-60
Rated Power (W)	1000
Type	ATX12V
Cooling	120mm Fluid Dynamic Bearing Fan (MGA12012XF-O25)
Semi-Passive Operation	✓ (selectable)
Cable Design	Fully Modular

TEST EQUIPMENT

Electronic Loads	Chroma 63601-5 x4 Chroma 63600-2 x2 63640-80-80 x20 63610-80-20 x2
AC Sources	Chroma 6530, Keysight AC6804B
Power Analyzers	N4L PPA1530 x2
Sound Analyzer	Bruel & Kjaer 2270 G4
Microphone	Bruel & Kjaer Type 4955-A
Data Loggers	Picoscope TC-08 x2, Labjack U3-HV x2
Tachometer	UNI-T UT372 x2
Digital Multimeter	Keysight U1273AX, Fluke 289, Keithley 2015 - THD
UPS	CyberPower OLS3000E 3kVA x2
Transformer	3kVA x2

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RESULTS

Temperature Range (°C /°F)	30-32 / 86-89.6
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
ALPM (Alternative Low Power Mode) compatible	✓
ATX 3.0 Ready	✓

115V

Average Efficiency	88.560%
Efficiency With 10W (≤500W) or 2% (>500W)	67.969
Average Efficiency 5VSB	79.337%
Standby Power Consumption (W)	0.0714000
Average PF	0.991
Avg Noise Output	27.04 dB(A)
Efficiency Rating (ETA)	GOLD
Noise Rating (LAMBDA)	A-

230V

Average Efficiency	90.806%
Average Efficiency 5VSB	76.878%
Standby Power Consumption (W)	0.1615000
Average PF	0.966
Avg Noise Output	26.84 dB(A)
Efficiency Rating (ETA)	GOLD
Noise Rating (LAMBDA)	A-

POWER SPECIFICATIONS

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	20	20	83.33	2.5	0.3
	Watts	120		1000	12.5	3.6
Total Max. Power (W)		1000				

HOLD-UP TIME & POWER OK SIGNAL (230V)

Hold-Up Time (ms)	20.4
AC Loss to PWR_OK Hold Up Time (ms)	17.4
PWR_OK Inactive to DC Loss Delay (ms)	3

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CABLES AND CONNECTORS

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)	2	4	18AWG	No
6+2 pin PCIe (500mm+150mm)	1	2	18AWG	No
12+4 pin PCIe (700mm)	1	1	16-24AWG	No
SATA (500mm+150mm+150mm+150mm)	2	8	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 (1350mm) - C13 coupler	1	1	18AWG	-

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General Data	-
Manufacturer (OEM)	FSP
PCB Type	Double Sided
Primary Side	-
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	NTC Thermistor SCK-056 (5 Ohm) & Relay
Bridge Rectifier(s)	2x HY GBJ2506 (600V, 25A @ 100°C)
APFC MOSFETs	2x Infineon IPA60R120P7 (600V, 16A @ 100°C, Rds(on): 0.12Ohm)
APFC Boost Diode	1x CREE C3D08060A (600V, 8A @ 150°C)
Bulk Cap(s)	1x Nippon Chemi-Con (450V, 680uF, 3,000h @ 105°C, KHS)
Main Switchers	2x Magnachip MMFT60R115PC (600V, 20.9A @ 100°C, Rds(on): 0.115Ohm)
APFC Controller	Infineon ICE2PCS02G
Resonant Controller	Champion CM6901T2X
Topology	Primary side: APFC, Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	6x Infineon BSC014N04LSI (40V, 123A @ 100°C, Rds(on): 1.45mOhm)
5V & 3.3V	DC-DC Converters: 6x NEC 2SK3062-ZJ (60V, 70A, Rds(on): 8.5mOhm) PWM Controller(s): ANPEC APW7159C
Filtering Capacitors	Electrolytic: 4x Nippon Chemi-Con (2-5,000h @ 105°C, KZE), 2x Rubycon (3-6,000h @ 105°C, YXG), 2x Rubycon (2-10,000h @ 105°C, YXF), 1x Rubycon (6-10,000h @ 105°C, ZLH), 1x TK (105°C) Polymer: 29x Nippon Chemi-Con, 1x NIC
Supervisor IC	Weltrend WT7527RA (OCP, OVP, UVP, SCP,PG)
Fan Controller	APW9010
Fan Model	Protechnic Electric MGA12012XF-O25 (120mm, 12V, 0.52A, Fluid Dynamic Bearing)
5VSB Circuit	-
Rectifier	1x CET CEF04N7G (700V, 4A, Rds(on): 3.3Ohm) & 1x PFC P15L50SP SBR (50V, 15A)
Standby PWM Controller	97CL2N13

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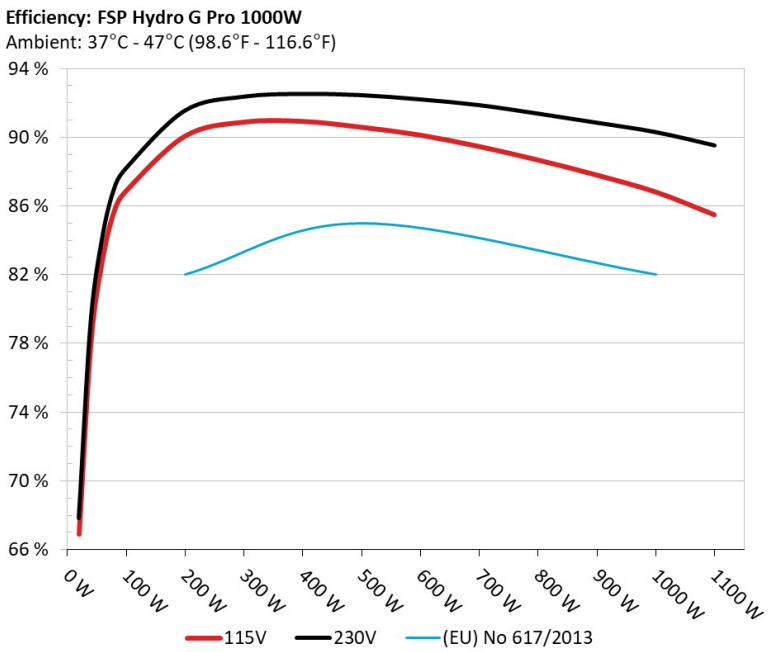
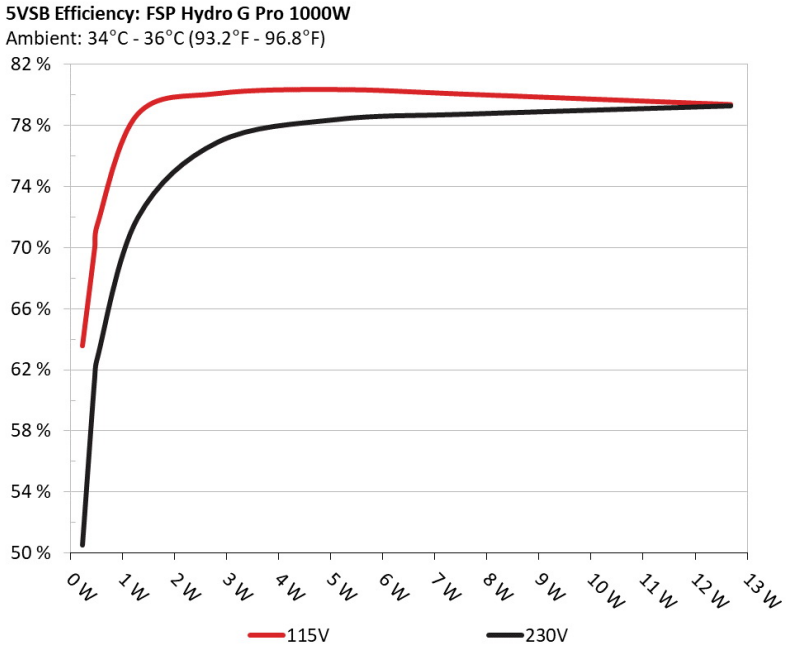
EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE



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

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5VSB EFFICIENCY -115V (ERP LOT 3/6 & CEC)

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.232W	63.597%	0.035
	5.166V	0.365W		115.17V
2	0.09A	0.465W	69.948%	0.064
	5.163V	0.665W		115.17V
3	0.55A	2.829W	80.065%	0.263
	5.145V	3.533W		115.16V
4	1A	5.128W	80.323%	0.352
	5.128V	6.384W		115.17V
5	1.5A	7.666W	80.013%	0.408
	5.111V	9.58W		115.16V
6	2.499A	12.681W	79.346%	0.462
	5.074V	15.982W		115.16V

5VSB EFFICIENCY -230V (ERP LOT 3/6 & CEC)

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.232W	50.516%	0.013
	5.165V	0.459W		230.33V
2	0.09A	0.464W	61.366%	0.022
	5.162V	0.757W		230.33V
3	0.55A	2.829W	76.875%	0.102
	5.145V	3.679W		230.33V
4	1A	5.128W	78.365%	0.168
	5.128V	6.543W		230.33V
5	1.5A	7.665W	78.714%	0.224
	5.11V	9.738W		230.33V
6	2.499A	12.68W	79.248%	0.301
	5.074V	16.001W		230.33V

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115V

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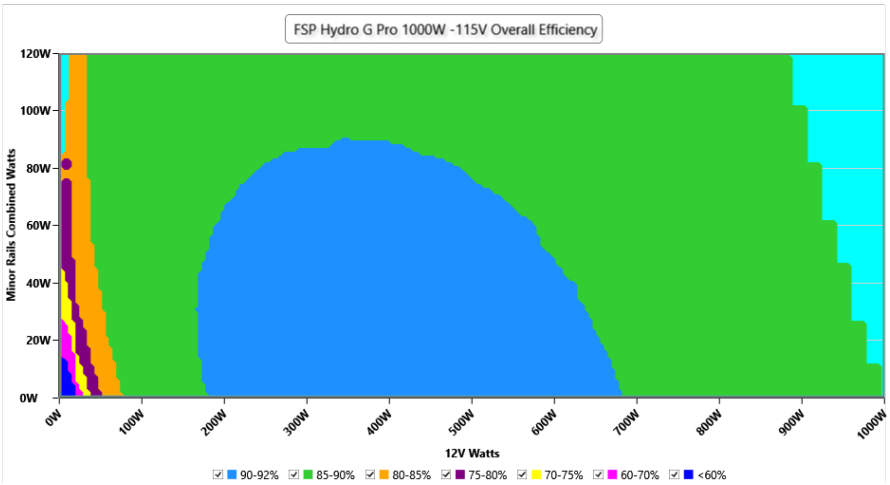
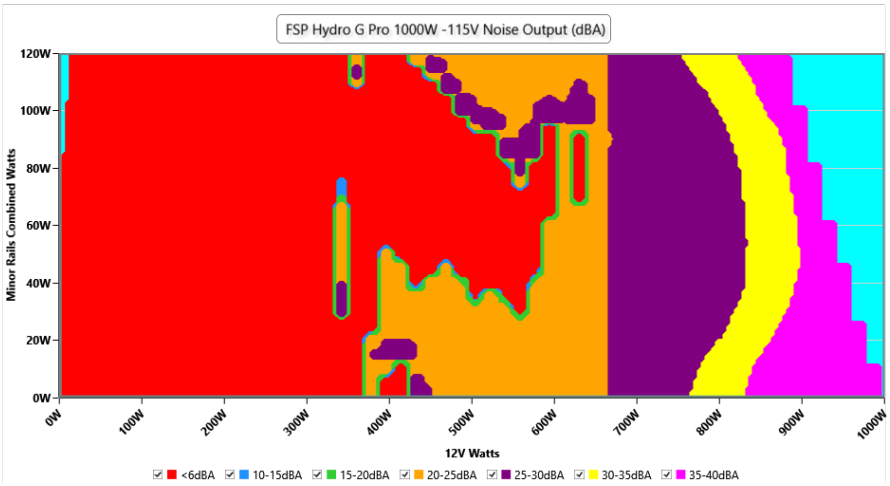
EFFICIENCY GRAPH 115V



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

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VAMPIRE POWER -115V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	115.15 V	115.11 V	113.85 V	115.19 V	116.15 V	PASS
Mains Frequency:	60.00 Hz	59.99 Hz	59.40 Hz	60.01 Hz	60.60 Hz	PASS
Mains Voltage CF:	1.416	1.415	1.340	1.418	1.490	PASS
Mains Voltage THD:	0.13 %	0.10 %	N/A	0.16 %	2.00 %	PASS
Real Power:	0.071 W	0.065 W	N/A	0.080 W	N/A	N/A
Apparent Power:	10.254 W	10.085 W	N/A	10.432 W	N/A	N/A
Power Factor:	0.007	N/A	N/A	N/A	N/A	N/A

INFO

This graph is generated by the PPA Standby Power Analysis software which takes full control of the power analyzer during the whole procedure. This application features all of the EN50564 & IEC62301 test limits for standby power software testing

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10-110% 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
10%	6.387A	1.977A	1.967A	0.974A	99.985	86.87%	0	<6.0	45.28°C	0.981
	12.273V	5.058V	3.355V	5.133V	115.1				40.96°C	115.16V
20%	13.786A	2.968A	2.954A	1.172A	199.927	90.053%	0	<6.0	46.2°C	0.996
	12.262V	5.054V	3.351V	5.119V	222.007				41.46°C	115.12V
30%	21.541A	3.465A	3.45A	1.371A	299.968	90.867%	0	<6.0	47.36°C	0.995
	12.252V	5.051V	3.348V	5.106V	330.115				42.01°C	115.1V
40%	29.264A	3.963A	3.946A	1.571A	399.469	90.913%	0	<6.0	48.52°C	0.995
	12.243V	5.047V	3.345V	5.093V	439.392				42.77°C	115.06V
50%	36.677A	4.957A	4.938A	1.772A	499.168	90.573%	1033	24.6	43.18°C	0.995
	12.233V	5.043V	3.341V	5.079V	551.124				49.19°C	115.04V
60%	44.181A	5.958A	5.935A	1.976A	599.697	90.113%	1035	24.6	43.49°C	0.995
	12.220V	5.036V	3.336V	5.062V	665.492				50.23°C	115V
70%	51.626A	6.957A	6.933A	2.179A	699.419	89.454%	1076	25.7	43.78°C	0.994
	12.209V	5.031V	3.332V	5.047V	781.873				51.25°C	114.97V
80%	59.156A	7.959A	7.929A	2.283A	799.425	88.671%	1509	35.8	44.23°C	0.993
	12.197V	5.027V	3.328V	5.036V	901.563				52.25°C	114.93V
90%	67.026A	8.46A	8.419A	2.387A	899.187	87.796%	1882	43.3	45.2°C	0.992
	12.185V	5.023V	3.324V	5.026V	1024.191				54.29°C	114.89V
100%	74.977A	8.965A	8.94A	2.492A	999.906	86.809%	2276	47.5	45.83°C	0.991
	12.174V	5.018V	3.321V	5.016V	1151.846				55.85°C	114.85V
110%	82.555A	9.971A	10.037A	2.495A	1099.721	85.486%	2687	51.0	46.5°C	0.99
	12.161V	5.014V	3.316V	5.009V	1286.444				57.42°C	114.81V
CL1	0.114A	14.318A	14.278A	0A	121.272	82.989%	0	<6.0	48.26°C	0.988
	12.264V	5.042V	3.34V	5.156V	146.129				42.74°C	115.14V
CL2	0.112A	19.811A	0A	0A	101.383	81.743%	939	21.6	43.89°C	0.982
	12.270V	5.048V	3.349V	5.164V	124.028				50.99°C	115.15V
CL3	0.112A	0A	19.707A	0A	67.364	77.267%	0	<6.0	52.64°C	0.971
	12.260V	5.061V	3.348V	5.16V	87.185				44.56°C	115.16V
CL4	82.057A	0A	0A	0A	999.805	87.427%	2019	44.4	45.29°C	0.991
	12.184V	5.031V	3.331V	5.118V	1143.59				55.21°C	114.86V

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20-80W 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
20W	1.206A	0.494A	0.491A	0.194A	19.99	66.898%	0	<6.0	40.19°C	0.884
	12.312V	5.062V	3.359V	5.166V	29.883				37.07°C	115.18V
40W	2.662A	0.691A	0.688A	0.29A	39.989	77.998%	0	<6.0	40.82°C	0.942
	12.279V	5.061V	3.358V	5.162V	51.269				37.46°C	115.17V
60W	4.118A	0.889A	0.884A	0.388A	59.987	82.921%	0	<6.0	41.82°C	0.962
	12.268V	5.061V	3.357V	5.157V	72.342				38.06°C	115.17V
80W	5.569A	1.087A	1.081A	0.485A	79.935	85.718%	0	<6.0	44.08°C	0.973
	12.266V	5.06V	3.356V	5.153V	93.254				40.1°C	115.16V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	16.93mV	8.39mV	7.79mV	9.61mV	Pass
20% Load	27.95mV	13.57mV	15.77mV	43.06mV	Pass
30% Load	24.35mV	12.81mV	13.09mV	36.33mV	Pass
40% Load	14.11mV	8.28mV	8.14mV	9.26mV	Pass
50% Load	29.41mV	12.85mV	17.44mV	38.96mV	Pass
60% Load	14.91mV	9.00mV	10.57mV	10.98mV	Pass
70% Load	32.23mV	14.99mV	19.01mV	38.15mV	Pass
80% Load	15.93mV	10.82mV	14.00mV	11.69mV	Pass
90% Load	27.14mV	15.96mV	19.92mV	36.33mV	Pass
100% Load	23.02mV	11.90mV	16.22mV	14.22mV	Pass
110% Load	23.81mV	11.90mV	17.12mV	14.49mV	Pass
Crossload1	18.81mV	14.80mV	14.84mV	10.45mV	Pass
Crossload2	16.48mV	12.09mV	10.57mV	9.82mV	Pass
Crossload3	24.35mV	12.15mV	15.62mV	36.99mV	Pass
Crossload4	23.08mV	11.18mV	15.07mV	13.88mV	Pass

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230V

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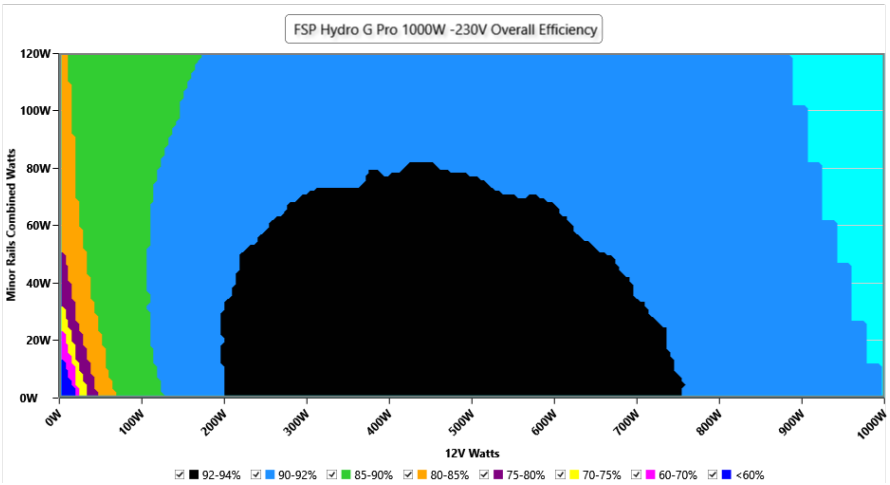
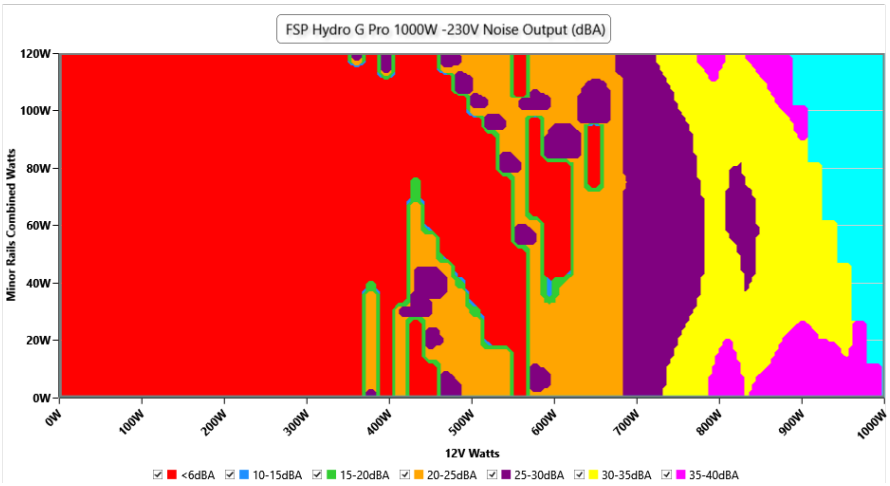
EFFICIENCY GRAPH 230V



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 230V



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VAMPIRE POWER -230V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	230.29 V	230.18 V	227.70 V	230.35 V	232.30 V	PASS
Mains Frequency:	50.00 Hz	49.99 Hz	49.50 Hz	50.01 Hz	50.50 Hz	PASS
Mains Voltage CF:	1.416	1.415	1.340	1.417	1.490	PASS
Mains Voltage THD:	0.12 %	0.10 %	N/A	0.22 %	2.00 %	PASS
Real Power:	0.162 W	0.146 W	N/A	0.194 W	N/A	N/A
Apparent Power:	34.265 W	33.950 W	N/A	34.612 W	N/A	N/A
Power Factor:	0.005	N/A	N/A	N/A	N/A	N/A

INFO

This graph is generated by the PPA Standby Power Analysis software which takes full control of the power analyzer during the whole procedure. This application features all of the EN50564 & IEC62301 test limits for standby power software testing

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Cybenetics offers the ETA and Lambda voluntary certification programs, through which the efficient and silent power supplies are promoted

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Anex

FSP Technology Inc. Hydro G Pro 1000W

10-110% LOAD TESTS 230V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
10%	6.386A	1.977A	1.967A	0.974A	99.967	88.208%	0	<6.0	44.35°C	0.892
	12.272V	5.058V	3.355V	5.134V	113.33				40.11°C	230.36V
20%	13.784A	2.968A	2.954A	1.172A	199.898	91.573%	0	<6.0	45.29°C	0.951
	12.261V	5.054V	3.351V	5.12V	218.295				40.62°C	230.35V
30%	21.536A	3.464A	3.449A	1.371A	299.935	92.393%	0	<6.0	46.62°C	0.97
	12.254V	5.052V	3.348V	5.106V	324.628				41.48°C	230.33V
40%	29.254A	3.961A	3.945A	1.571A	399.364	92.551%	0	<6.0	47.26°C	0.979
	12.244V	5.048V	3.345V	5.093V	431.506				41.62°C	230.32V
50%	36.690A	4.961A	4.941A	1.774A	499.265	92.478%	0	<6.0	48.82°C	0.983
	12.231V	5.041V	3.339V	5.074V	539.872				42.88°C	230.3V
60%	44.191A	5.959A	5.937A	1.976A	599.759	92.233%	1032	24.5	42.95°C	0.984
	12.218V	5.035V	3.335V	5.061V	650.262				49.36°C	230.29V
70%	51.632A	6.957A	6.934A	2.179A	699.424	91.9%	1152	27.8	43.47°C	0.983
	12.208V	5.032V	3.332V	5.047V	761.078				50.54°C	230.27V
80%	59.154A	7.957A	7.929A	2.282A	799.404	91.406%	1682	39.4	44.33°C	0.982
	12.197V	5.028V	3.328V	5.036V	874.56				52.39°C	230.26V
90%	67.020A	8.458A	8.418A	2.386A	899.15	90.876%	1999	43.9	44.65°C	0.98
	12.186V	5.024V	3.324V	5.026V	989.423				53.66°C	230.25V
100%	74.971A	8.963A	8.939A	2.491A	999.857	90.323%	2366	48.1	45.12°C	0.977
	12.174V	5.019V	3.321V	5.016V	1106.97				55.2°C	230.24V
110%	82.540A	9.968A	10.036A	2.494A	1099.678	89.551%	2788	51.6	46.61°C	0.974
	12.162V	5.015V	3.317V	5.01V	1227.993				57.52°C	230.22V
CL1	0.112A	14.312A	14.274A	0A	121.266	84.495%	1027	24.4	42.33°C	0.92
	12.264V	5.044V	3.341V	5.157V	143.516				48.81°C	230.35V
CL2	0.112A	19.808A	0A	0A	101.378	83.2%	0	<6.0	50.75°C	0.902
	12.271V	5.049V	3.349V	5.164V	121.848				43.66°C	230.36V
CL3	0.112A	0A	19.71A	0A	67.36	78.626%	0	<6.0	52.69°C	0.846
	12.260V	5.06V	3.348V	5.16V	85.675				44.62°C	230.36V
CL4	82.060A	0A	0A	0A	999.864	90.911%	2088	46.1	45.63°C	0.977
	12.184V	5.03V	3.331V	5.117V	1099.822				55.54°C	230.24V

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Anex

FSP Technology Inc. Hydro G Pro 1000W

20-80W LOAD TESTS 230V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
20W	1.205A	0.494A	0.491A	0.194A	19.984	67.829%	0	<6.0	39.72°C	0.523
	12.310V	5.061V	3.358V	5.165V	29.46				36.61°C	230.37V
40W	2.662A	0.692A	0.688A	0.29A	39.985	79.215%	0	<6.0	41.78°C	0.707
	12.278V	5.06V	3.357V	5.161V	50.474				38.5°C	230.37V
60W	4.118A	0.889A	0.884A	0.388A	59.984	84.209%	0	<6.0	42.51°C	0.804
	12.266V	5.06V	3.357V	5.157V	71.204				39.01°C	230.35V
80W	5.568A	1.087A	1.081A	0.485A	79.918	87.023%	0	<6.0	43.1°C	0.858
	12.264V	5.06V	3.356V	5.153V	91.834				39.24°C	230.36V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	42.91mV	15.86mV	16.13mV	42.86mV	Pass
20% Load	35.32mV	15.45mV	14.71mV	41.80mV	Pass
30% Load	12.07mV	6.81mV	8.24mV	9.87mV	Pass
40% Load	36.18mV	16.46mV	18.20mV	43.21mV	Pass
50% Load	29.97mV	13.32mV	15.78mV	38.71mV	Pass
60% Load	35.24mV	16.11mV	17.95mV	41.54mV	Pass
70% Load	33.67mV	16.67mV	15.57mV	43.42mV	Pass
80% Load	16.23mV	10.82mV	14.51mV	11.54mV	Pass
90% Load	29.06mV	13.87mV	19.41mV	37.34mV	Pass
100% Load	23.60mV	15.36mV	16.52mV	13.81mV	Pass
110% Load	24.70mV	12.19mV	17.50mV	15.22mV	Pass
Crossload1	18.26mV	16.19mV	13.85mV	10.34mV	Pass
Crossload2	35.32mV	16.21mV	16.68mV	37.39mV	Pass
Crossload3	27.34mV	11.74mV	14.11mV	36.43mV	Pass
Crossload4	23.33mV	12.58mV	15.07mV	13.04mV	Pass

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Anex

FSP Technology Inc. Hydro G Pro 1000W

Top side

Power specifications label

CERTIFICATIONS 115V

CERTIFICATIONS 230V

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