

Anex

be quiet! Pure Power 11 FM 850W

Lab ID#: BQ85001988
 Receipt Date: Feb 10, 2022
 Test Date: Mar 8, 2022

Report: 22PS1988A
 Report Date: Mar 9, 2022

DUT INFORMATION	
Brand	be quiet!
Manufacturer (OEM)	HEC
Series	Pure Power 11 FM
Model Number	
Serial Number	324H1480009915
DUT Notes	

DUT SPECIFICATIONS	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	50-60
Rated Frequency (Hz)	12-6
Rated Power (W)	850
Type	ATX12V
Cooling	120mm Rifle Bearing Fan (BQ QF2-12025-HS)
Semi-Passive Operation	x
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

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

Anex

be quiet! Pure Power 11 FM 850W

RESULTS

Temperature Range (°C /°F)	30-32 / 86-89.6
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓

115V

Average Efficiency	89.094%
Efficiency With 10W (≤500W) or 2% (>500W)	74.002
Average Efficiency 5VSB	80.374%
Standby Power Consumption (W)	0.0554908
Average PF	0.979
Avg Noise Output	28.98 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	A-

230V

Average Efficiency	91.183%
Average Efficiency 5VSB	80.117%
Standby Power Consumption (W)	0.0888778
Average PF	0.939
Avg Noise Output	28.64 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	A-

POWER SPECIFICATIONS

Rail		3.3V	5V	12V(1)	12V(2)	5VSB	-12V
Max. Power	Amps	22	22	40	36	3	0.3
	Watts	120		849.6		15	3.6
Total Max. Power (W)		850					

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

Hold-Up Time (ms)	20.8
AC Loss to PWR_OK Hold Up Time (ms)	18.2
PWR_OK Inactive to DC Loss Delay (ms)	2.6

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

PAGE 2/17

CABLES AND CONNECTORS

Modular Cables

Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (550mm)	1	1	16-22AWG	No
4+4 pin EPS12V (600mm)	1	1	18AWG	No
8 pin EPS12V (600mm)	1	1	18AWG	No
6+2 pin PCIe (500mm+150mm)	2	4	16-18AWG	No
SATA (500mm+150mm+150mm+150mm)	2	8	18AWG	No
SATA (500mm+150mm) / 4-pin Molex (+150mm+150mm) / FDD (+150mm)	1	2 / 2 / 1	18-20AWG	No
AC Power Cord (1360mm) - C13 coupler	1	1	18AWG	-

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

Anex

be quiet! Pure Power 11 FM 850W

General Data	-
Manufacturer (OEM)	HEC
PCB Type	Double Sided
Primary Side	-
Transient Filter	4x Y caps, 3x X caps, 2x CM chokes, 1x MOV, 1x Power Integrations CAP200G (Discharge IC)
Inrush Protection	NTC Thermistor SCK-056 (5 Ohm) & Relay
Bridge Rectifier(s)	2x MCC GBU15KL (800V, 15A @ 100°C)
APFC MOSFETs	3x Infineon IPAW60R180P7S (600V, 11A @ 100°C, Rds(on): 0.18Ohm)
APFC Boost Diode	1x CREE C6D08065A (650V, 8A @ 155°C)
Bulk Cap(s)	2x Teapo (400V, 390uF each or 780uF, 2,000h @ 105°C, LG)
Main Switchers	2x Infineon IPA60R120P7 (600V, 16A @ 100°C, Rds(on): 0.12Ohm)
APFC Controller	Champion CM6500UNX & CM03AX
Resonant Controller	Champion CM6901T6X
Topology	Primary side: APFC, Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	6x Nexperia PSMN1R9-40YSD (40V, 162A @ 100°C, Rds(on): 1.9mOhm)
5V & 3.3V	DC-DC Converters
Filtering Capacitors	Electrolytic: 13x Teapo (1-3,000h @ 105°C, SC), 1x Elite (105°C, EM) Polymer: 12x Teapo, 16x no info
Supervisor IC	Weltrend WT7527RT (OCP, OVP, UVP, SCP, PG)
Fan Model	be quiet! BQ QF2-12025-HS (120mm, 12V, 0.30A, Rifle Bearing Fan)
5VSB Circuit	-
Rectifier	1x SECOS SMPD1060L SBR (60V, 10A)
Standby PWM Controller	Excelliance MOS EM8569D

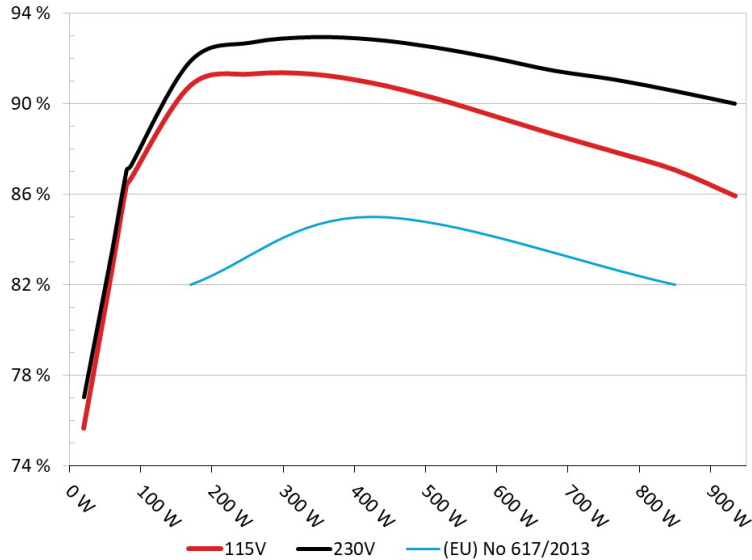
All data and graphs included in this test report can be used by any individual on the following conditions:

- > 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

PAGE 4/17

EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

Efficiency: be quiet! Pure Power 11 FM 850W
Ambient: 37°C - 47°C (98.6°F - 116.6°F)

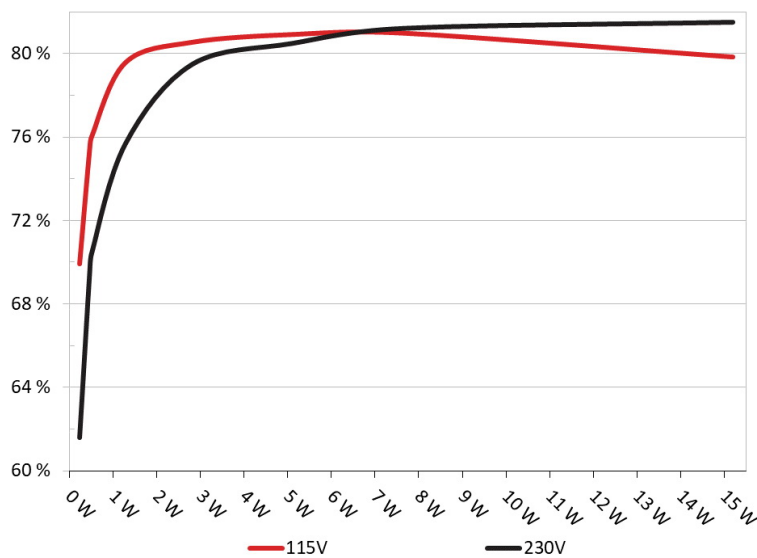


INFO

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: be quiet! Pure Power 11 FM 850W
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

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

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.231W	69.913%	0.025
	5.125V	0.33W		115.1V
2	0.09A	0.461W	75.408%	0.047
	5.123V	0.611W		115.08V
3	0.55A	2.812W	80.531%	0.226
	5.114V	3.492W		115.09V
4	1A	5.104W	80.9%	0.33
	5.104V	6.309W		115.09V
5	1.5A	7.643W	80.965%	0.394
	5.095V	9.439W		115.09V
6	3A	15.197W	79.823%	0.471
	5.066V	19.038W		115.09V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.231W	61.601%	0.009
	5.125V	0.375W		230.24V
2	0.09A	0.461W	69.494%	0.016
	5.123V	0.663W		230.22V
3	0.55A	2.813W	79.486%	0.082
	5.113V	3.539W		230.23V
4	1A	5.105W	80.486%	0.14
	5.105V	6.343W		230.23V
5	1.5A	7.643W	81.205%	0.193
	5.095V	9.411W		230.24V
6	3A	15.197W	81.498%	0.302
	5.065V	18.647W		230.24V

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

Anex

be quiet! Pure Power 11 FM 850W

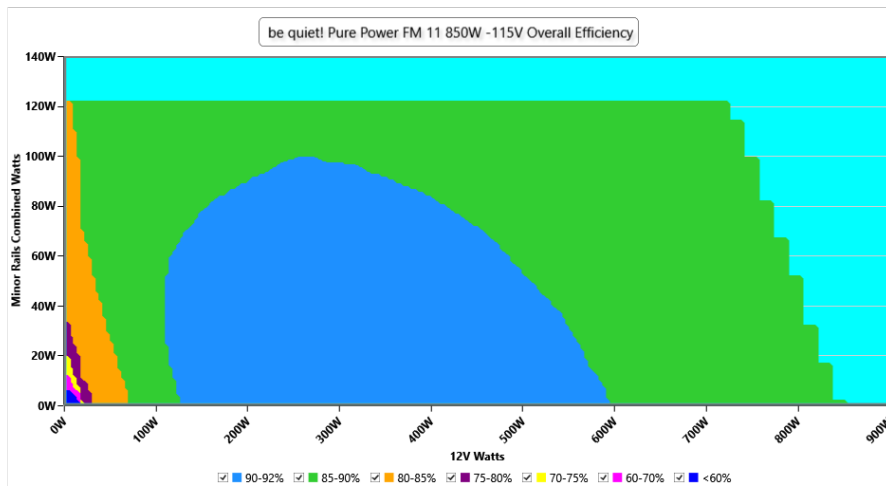
115V

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

PAGE 7/17

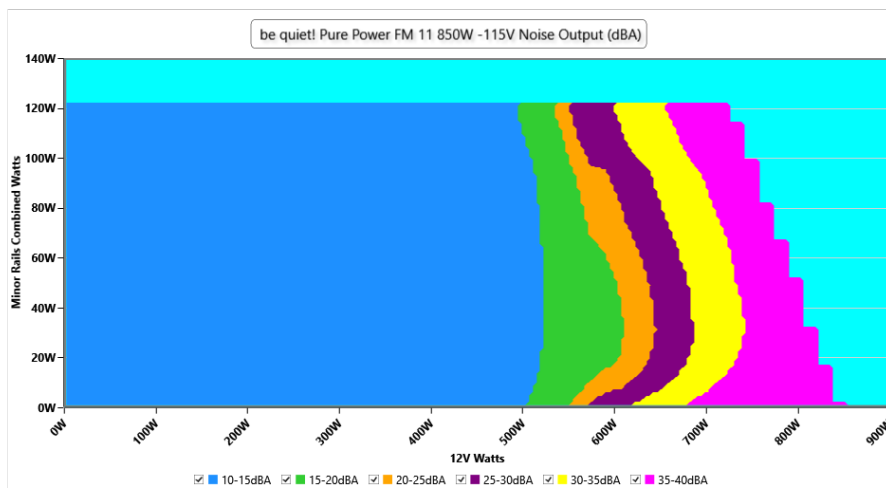
EFFICIENCY GRAPH 115V



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

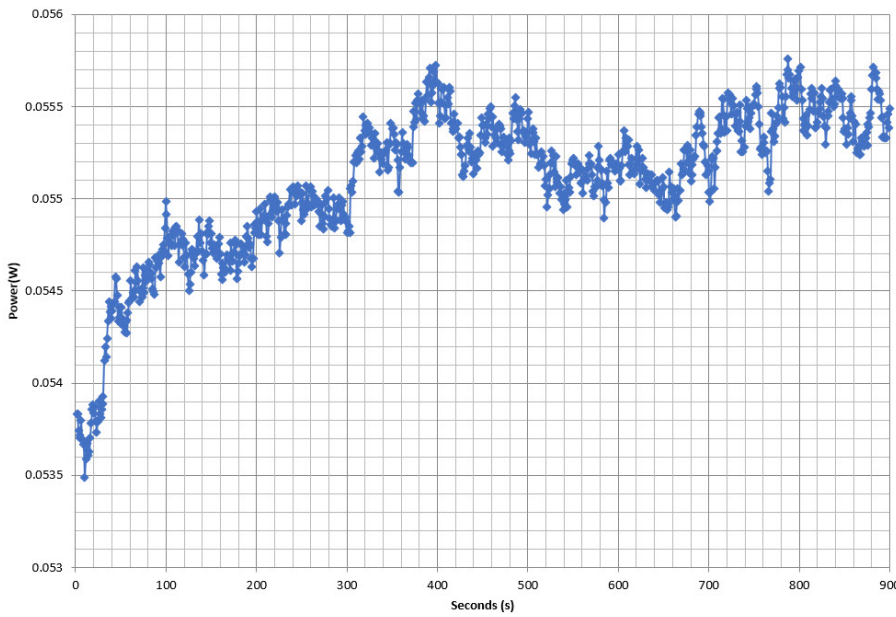
The PSU's noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails

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

VAMPIRE POWER -115V

Power - 324H1480009915 - 02/03/2022 - 10:23



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

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

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%	5.208A	1.992A	2.001A	0.979A	85.005	86.626%	736	12.4	40.2°C	0.945
	12.174V	5.02V	3.297V	5.105V	98.128				44.72°C	115.09V
20%	11.445A	2.989A	3.004A	1.178A	169.963	90.809%	735	12.4	40.86°C	0.965
	12.150V	5.018V	3.295V	5.093V	187.165				45.82°C	115.09V
30%	18.038A	3.488A	3.507A	1.377A	254.97	91.315%	736	12.4	41.2°C	0.971
	12.137V	5.017V	3.293V	5.083V	279.221				46.72°C	115.1V
40%	24.648A	3.988A	4.01A	1.577A	340.065	91.312%	738	12.7	41.36°C	0.978
	12.125V	5.015V	3.291V	5.072V	372.42				47.37°C	115.1V
50%	30.918A	4.986A	5.016A	1.779A	425.035	90.915%	760	13.4	42.09°C	0.983
	12.114V	5.014V	3.29V	5.06V	467.506				48.61°C	115.1V
60%	37.164A	5.985A	6.023A	1.981A	509.555	90.271%	1047	23.7	42.87°C	0.987
	12.102V	5.013V	3.288V	5.049V	564.471				49.81°C	115.09V
70%	43.492A	6.986A	7.031A	2.184A	594.825	89.467%	1592	36.2	43.34°C	0.989
	12.088V	5.011V	3.285V	5.037V	664.855				50.81°C	115.09V
80%	49.842A	7.989A	8.041A	2.288A	679.645	88.645%	1848	40.3	43.59°C	0.991
	12.073V	5.008V	3.283V	5.027V	766.702				51.75°C	115.08V
90%	56.600A	8.491A	8.534A	2.392A	765.064	87.871%	1848	40.3	44.88°C	0.993
	12.059V	5.006V	3.281V	5.018V	870.671				53.77°C	115.08V
100%	63.117A	8.998A	9.061A	3.002A	849.862	87.071%	1854	40.4	45.76°C	0.994
	12.044V	5.002V	3.277V	4.998V	976.055				55.76°C	115.07V
110%	69.498A	9.996A	10.162A	3.007A	934.464	85.921%	1848	40.3	47.45°C	0.995
	12.032V	5.003V	3.276V	4.989V	1087.591				58.34°C	115.06V
CL1	0.115A	14.411A	14.503A	0A	121.311	84.299%	788	14.7	42.74°C	0.969
	12.158V	5.011V	3.288V	5.107V	143.909				48.01°C	115.1V
CL2	0.115A	21.959A	0A	0A	111.418	83.334%	751	13.0	43.64°C	0.967
	12.165V	5.01V	3.302V	5.116V	133.7				50.52°C	115.1V
CL3	0.115A	0A	22.093A	0A	73.98	77.162%	739	12.7	44.14°C	0.944
	12.178V	5.027V	3.285V	5.113V	95.877				51.68°C	115.11V
CL4	70.479A	0A	0A	0A	849.571	87.77%	1861	40.7	45.4°C	0.994
	12.055V	5.022V	3.292V	5.072V	967.961				55.42°C	115.07V

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

Anex

be quiet! Pure Power 11 FM 850W

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	1.222A	0.498A	0.5A	0.195A	19.997	75.655%	718	11.6	36.97°C	0.844
	12.157V	5.022V	3.3V	5.124V	26.432				40.05°C	115.08V
40W	2.688A	0.697A	0.7A	0.293A	39.998	82.709%	723	11.8	38.07°C	0.918
	12.159V	5.021V	3.299V	5.121V	48.36				41.35°C	115.08V
60W	4.150A	0.896A	0.9A	0.391A	59.998	83.46%	733	12.2	39.38°C	0.952
	12.177V	5.022V	3.299V	5.12V	71.888				43.06°C	115.09V
80W	5.612A	1.095A	1.1A	0.489A	79.947	86.398%	736	12.4	39.72°C	0.943
	12.175V	5.022V	3.299V	5.117V	92.534				43.81°C	115.09V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	11.82mV	9.29mV	7.31mV	8.65mV	Pass
20% Load	13.71mV	10.01mV	7.87mV	8.39mV	Pass
30% Load	12.33mV	9.96mV	7.52mV	8.85mV	Pass
40% Load	12.69mV	9.75mV	7.93mV	9.06mV	Pass
50% Load	14.43mV	10.01mV	8.39mV	9.72mV	Pass
60% Load	15.51mV	10.78mV	8.90mV	9.98mV	Pass
70% Load	17.19mV	11.29mV	9.31mV	10.39mV	Pass
80% Load	17.91mV	11.54mV	11.56mV	11.05mV	Pass
90% Load	19.55mV	12.26mV	11.71mV	12.69mV	Pass
100% Load	24.69mV	13.07mV	12.10mV	17.22mV	Pass
110% Load	27.28mV	13.99mV	14.34mV	18.88mV	Pass
Crossload1	24.86mV	11.50mV	13.68mV	8.93mV	Pass
Crossload2	17.88mV	13.84mV	18.67mV	8.19mV	Pass
Crossload3	14.28mV	11.49mV	14.58mV	7.37mV	Pass
Crossload4	24.95mV	12.30mV	9.56mV	15.32mV	Pass

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

PAGE 11/17

Anex

be quiet! Pure Power 11 FM 850W

230V

All data and graphs included in this test report can be used by any individual on the following conditions:

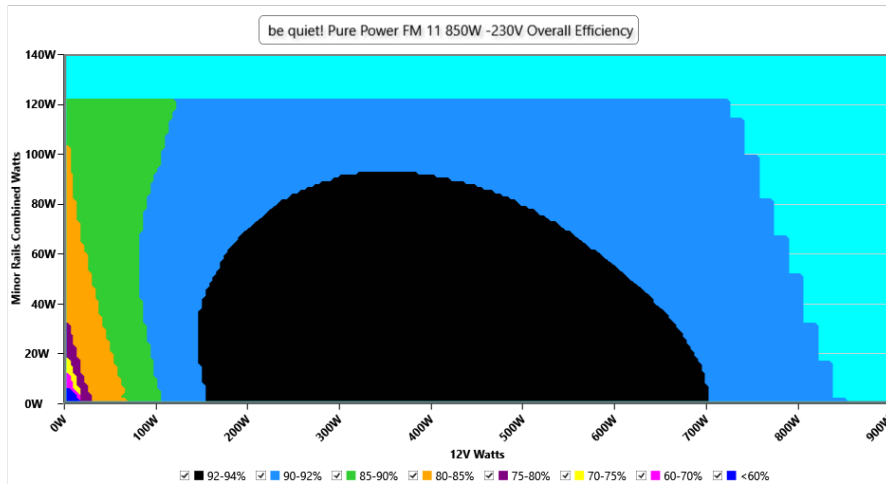
- > It should be mentioned that the test results are provided by Cybenetics
- > The link to the original test results document should be provided in any case

PAGE 12/17

Anex

be quiet! Pure Power 11 FM 850W

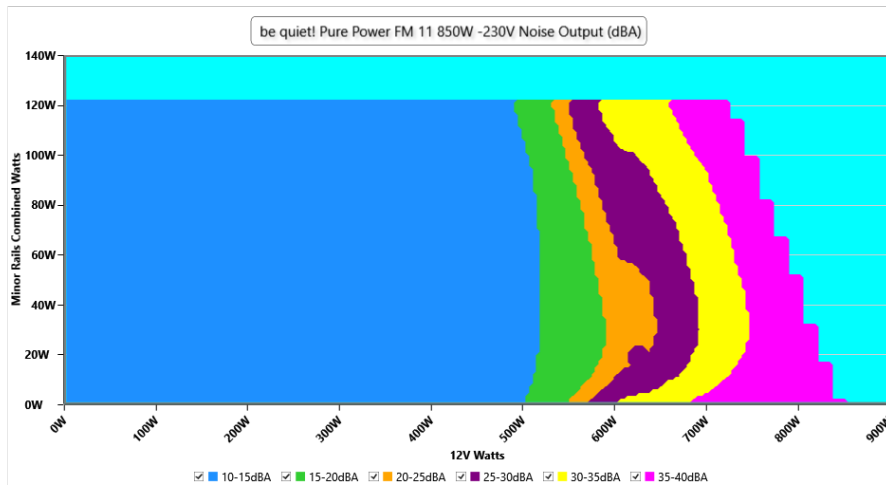
EFFICIENCY GRAPH 230V



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



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

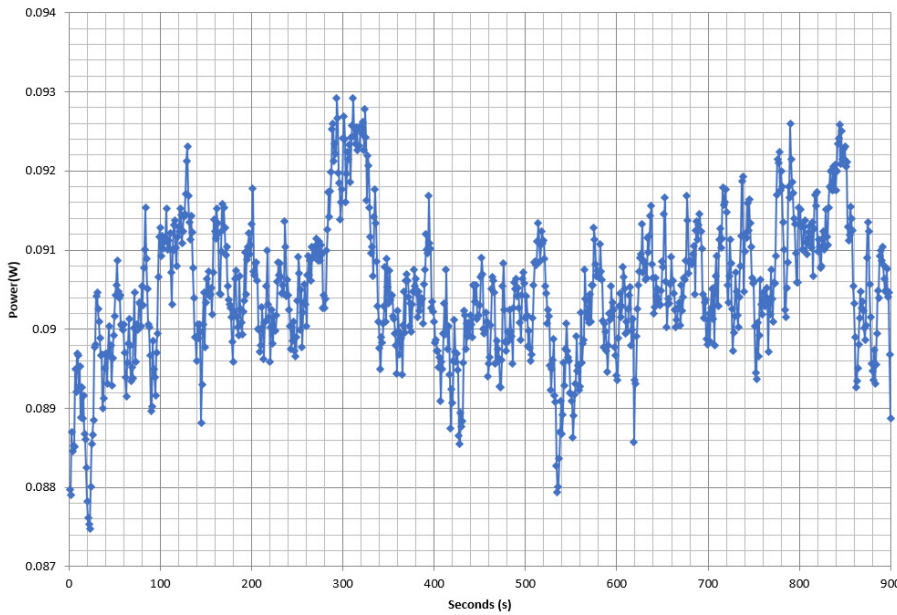
All data and graphs included in this test report can be used by any individual on the following conditions:

- > 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

PAGE 13/17

VAMPIRE POWER -230V

Power - 324H1480009915 - 02/03/2022 - 10:23



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

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

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%	5.207A	1.991A	2.001A	0.98A	85.009	87.218%	740	13.1	40.34°C	0.808
	12.178V	5.022V	3.298V	5.105V	97.468				44.83°C	230.23V
20%	11.443A	2.989A	3.004A	1.178A	169.97	91.898%	737	12.4	40.98°C	0.901
	12.153V	5.019V	3.295V	5.092V	184.954				45.84°C	230.23V
30%	18.036A	3.489A	3.507A	1.378A	254.984	92.705%	737	12.4	41.01°C	0.935
	12.139V	5.017V	3.293V	5.082V	275.049				46.23°C	230.24V
40%	24.646A	3.988A	4.01A	1.578A	340.075	92.943%	740	13.1	41.71°C	0.948
	12.127V	5.016V	3.292V	5.071V	365.897				47.36°C	230.24V
50%	30.917A	4.986A	5.016A	1.779A	425.049	92.84%	755	13.2	42.16°C	0.959
	12.115V	5.014V	3.29V	5.059V	457.828				48.19°C	230.24V
60%	37.163A	5.986A	6.024A	1.981A	509.562	92.505%	849	17.2	42.49°C	0.963
	12.102V	5.012V	3.287V	5.048V	550.847				49.21°C	230.24V
70%	43.499A	6.989A	7.034A	2.185A	594.9	92.022%	1420	33.0	43.69°C	0.967
	12.087V	5.009V	3.284V	5.036V	646.479				50.84°C	230.24V
80%	49.849A	7.993A	8.045A	2.289A	679.724	91.464%	1814	40.0	43.71°C	0.972
	12.073V	5.006V	3.281V	5.025V	743.158				51.67°C	230.24V
90%	56.608A	8.494A	8.537A	2.393A	765.146	91.071%	1849	40.3	44.92°C	0.975
	12.059V	5.005V	3.28V	5.016V	840.161				53.61°C	230.24V
100%	63.113A	8.996A	9.061A	3.003A	849.963	90.564%	1845	40.3	45.13°C	0.977
	12.046V	5.004V	3.278V	4.996V	938.524				55.1°C	230.24V
110%	69.511A	10A	10.166A	3.008A	934.542	90.006%	1846	40.3	46.81°C	0.979
	12.031V	5.002V	3.275V	4.988V	1038.309				57.68°C	230.24V
CL1	0.115A	14.413A	14.505A	0A	121.323	85.456%	800	15.2	42.63°C	0.877
	12.159V	5.011V	3.288V	5.106V	141.971				48.65°C	230.25V
CL2	0.115A	21.955A	0A	0A	111.428	84.192%	756	13.3	43.74°C	0.867
	12.166V	5.012V	3.303V	5.115V	132.349				50.92°C	230.25V
CL3	0.115A	0A	22.093A	0A	73.988	77.622%	743	12.7	44.71°C	0.804
	12.181V	5.028V	3.286V	5.112V	95.318				53.03°C	230.25V
CL4	70.486A	0A	0A	0A	849.68	91.14%	1857	40.5	45.9°C	0.977
	12.055V	5.02V	3.29V	5.071V	932.277				55.98°C	230.25V

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

Anex

be quiet! Pure Power 11 FM 850W

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	1.222A	0.498A	0.5A	0.195A	20.005	77.043%	724	11.7	37.1°C	0.435
	12.163V	5.023V	3.3V	5.123V	25.966				40.11°C	230.23V
40W	2.688A	0.697A	0.7A	0.293A	40.005	83.585%	727	12.2	37.26°C	0.623
	12.162V	5.022V	3.299V	5.121V	47.862				40.59°C	230.23V
60W	4.150A	0.896A	0.9A	0.391A	60.004	83.917%	732	12	38.72°C	0.736
	12.177V	5.021V	3.299V	5.12V	71.504				42.23°C	230.23V
80W	5.612A	1.095A	1.1A	0.489A	79.961	87.089%	736	12.4	39.4°C	0.796
	12.176V	5.022V	3.299V	5.116V	91.816				43.29°C	230.23V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	12.49mV	10.16mV	7.52mV	8.65mV	Pass
20% Load	12.74mV	9.65mV	7.16mV	8.19mV	Pass
30% Load	12.64mV	10.37mV	7.87mV	8.60mV	Pass
40% Load	13.05mV	10.06mV	7.52mV	8.65mV	Pass
50% Load	15.45mV	10.16mV	7.98mV	9.31mV	Pass
60% Load	15.25mV	10.37mV	8.34mV	10.13mV	Pass
70% Load	16.22mV	10.73mV	8.90mV	10.18mV	Pass
80% Load	18.63mV	10.21mV	10.13mV	11.05mV	Pass
90% Load	18.52mV	11.24mV	10.94mV	11.41mV	Pass
100% Load	25.15mV	11.67mV	11.69mV	13.13mV	Pass
110% Load	26.49mV	11.93mV	12.18mV	13.50mV	Pass
Crossload1	24.35mV	11.44mV	14.33mV	9.37mV	Pass
Crossload2	17.02mV	12.87mV	16.77mV	7.98mV	Pass
Crossload3	13.61mV	11.08mV	14.01mV	7.78mV	Pass
Crossload4	24.93mV	11.16mV	8.45mV	10.64mV	Pass

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

PAGE 16/17

Anex

be quiet! Pure Power 11 FM 850W



Top side



Power specifications label

CERTIFICATIONS 115V



CERTIFICATIONS 230V



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