Anex

Deepcool PN650M

Lab ID#: DC65002319
Receipt Date: Dec 12, 2023
Test Date: Jan 5, 2024

Report: 24PS2319A
Report Date: Jan 5, 2024

DUT INFORMATION

Brand	Deepcool
Manufacturer (OEM)	CWT
Series	PN-M
Model Number	PN650M-FC
Serial Number	
DUT Notes	

DUT SPECIFICATIONS

Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10-5
Rated Frequency (Hz)	50-60
Rated Power (W)	650
Type	ATX12V
Cooling	120mm Rifle Bearing Fan (DF1202512SEHN)
Semi-Passive Operation	✗
Cable Design	Fully Modular

TEST EQUIPMENT

Electronic Loads	Chroma 63601-5 x2 Chroma 63600-2 63640-80-80 x10 63610-80-20
AC Sources	Chroma 6530, APM SP300VAC4000W-P
Power Analyzers	RS HMC8015, N4L PPA1530, N4L PPA5530
Oscilloscopes	Picoscope 4444, Rigol DS7014, 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, Keithley 2015 - THD
UPS	FSP Champ Tower 3kVA, CyberPower OLS3000E 3kVA
Isolation Transformer	4kVA

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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 v3.1 PSU Power Excursion	✓

115V

Average Efficiency	88.271%
Efficiency With 10W (≤500W) or 2% (>500W)	62.179
Average Efficiency 5VSB	78.330%
Standby Power Consumption (W)	0.0394000
Average PF	0.979
Avg Noise Output	32.99 dB(A)
Efficiency Rating (ETA)	GOLD
Noise Rating (LAMBDA)	Standard++

230V

Average Efficiency	90.436%
Average Efficiency 5VSB	78.213%
Standby Power Consumption (W)	0.1109000
Average PF	0.932
Avg Noise Output	32.35 dB(A)
Efficiency Rating (ETA)	GOLD
Noise Rating (LAMBDA)	Standard++

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				

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

Hold-Up Time (ms)	17.4
AC Loss to PWR_OK Hold Up Time (ms)	16
PWR_OK Inactive to DC Loss Delay (ms)	1.4

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CABLES AND CONNECTORS

Modular Cables

Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (550mm)	1	1	18AWG	No
4+4 pin EPS12V (700mm)	2	2	18AWG	No
6+2 pin PCIe (550mm)	3	3	18AWG	No
12+4 pin PCIe (600mm) (450W)	1	1	16-24AWG	No
SATA (450mm+120mm+120mm+120mm) / 4-pin Molex (+120mm)	2	8 / 2	18AWG	No

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General Data	-
Manufacturer (OEM)	CWT
Platform Model	GPX
PCB Type	Double-Sided
Primary Side	-
Transient Filter	2x Y caps, 1x X caps, 2x CM chokes, 1x MOV, 1x CAP200DG (Discharge IC)
Inrush Protection	NTC Thermistor SCK056 (5 Ohm @ 25°C) & Relay
Bridge Rectifier(s)	1x Yangjie Electronic GBU1506 (600V, 15A @ 100°C)
APFC MOSFETs	2x Way On WML25N50C4 (550V, 13A, Rds(on): 0.16Ohm) & 1x Champion CM03X FET (for reduced no-load consumption)
APFC Boost Diode	1x ST Micro Electronics STTH8S06 (600V, 8A)
Bulk Cap(s)	1x Nippon Chemi-Con (400V, 470uF, 2000h @ 100°C, KMW)
Main Switchers	4x Silan Microelectronics SVF13N50F (500V, 8.2A @ 100°C, Rds(on): 0.52Ohm)
APFC Controller	Champion 6500UNX
Resonant Controller	Champion CM6901X
Topology	Primary side: APFC, Full-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	4x IPS 014N04SA
5V & 3.3V	DC-DC Converters: 4x UBIQ QM3054M6 (30V, 97A @ 25°C, Rds(on): 4.8mOhm) PWM Controller(s): ANPEC APW7159C
Filtering Capacitors	Electrolytic: 15x Chengx (2,000 @ 105°C, GR) Polymer: 27x FCAP
Supervisor IC	IN1S429I - DCG
Fan Model	MARTECH DF1202512SEHN (120mm, 12V, 0.42A, Rifle Bearing Fan)
5VSB Circuit	-
Standby PWM Controller	Power Integrations TNY287PG

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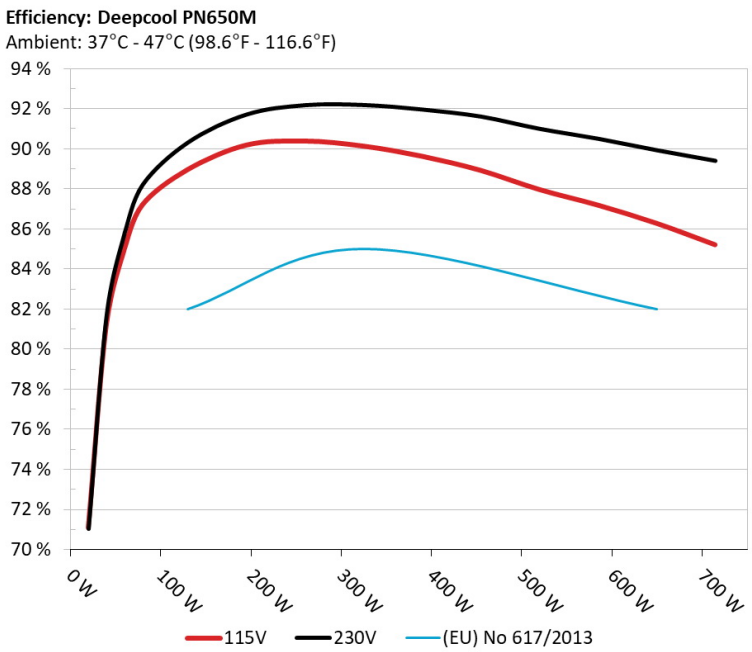
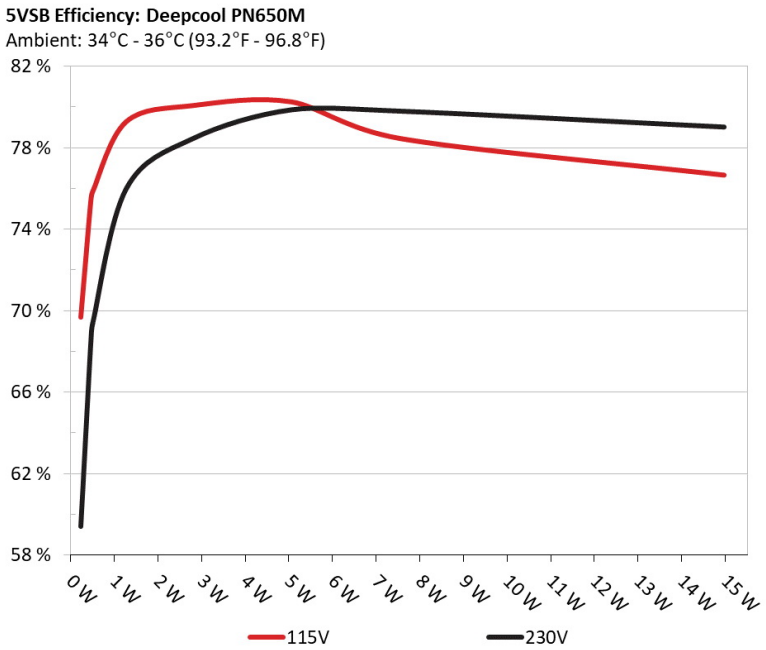
EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE



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	0.229W	69.196%	0.032
	5.089V	0.331W		114.85V
2	0.09A	0.458W	74.918%	0.058
	5.089V	0.611W		114.85V
3	0.55A	2.791W	79.592%	0.261
	5.074V	3.507W		114.85V
4	1A	5.059W	79.774%	0.361
	5.059V	6.342W		114.85V
5	1.5A	7.561W	77.969%	0.407
	5.04V	9.697W		114.85V
6	3A	14.97W	76.175%	0.479
	4.99V	19.651W		114.85V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.229W	58.895%	0.011
	5.089V	0.389W		229.86V
2	0.09A	0.458W	67.935%	0.019
	5.089V	0.674W		229.86V
3	0.55A	2.79W	77.94%	0.097
	5.073V	3.58W		229.86V
4	1A	5.059W	79.362%	0.162
	5.058V	6.375W		229.86V
5	1.5A	7.561W	79.292%	0.204
	5.04V	9.536W		229.85V
6	3A	14.965W	78.512%	0.316
	4.988V	19.062W		229.86V

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115V

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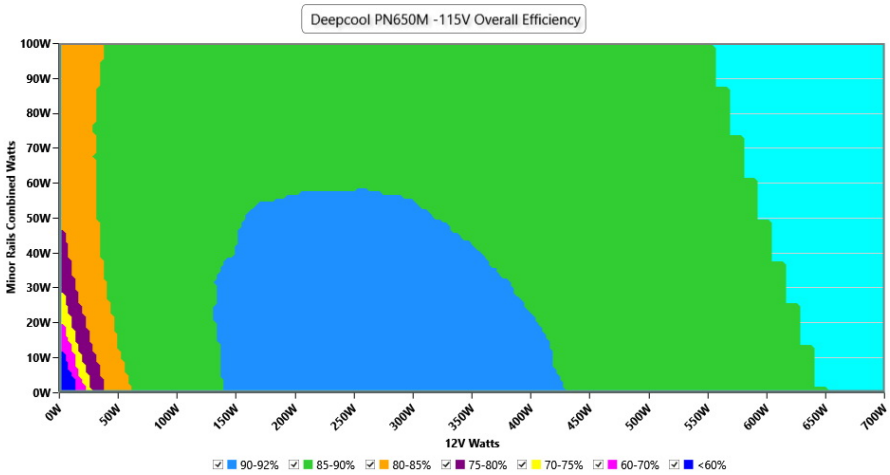
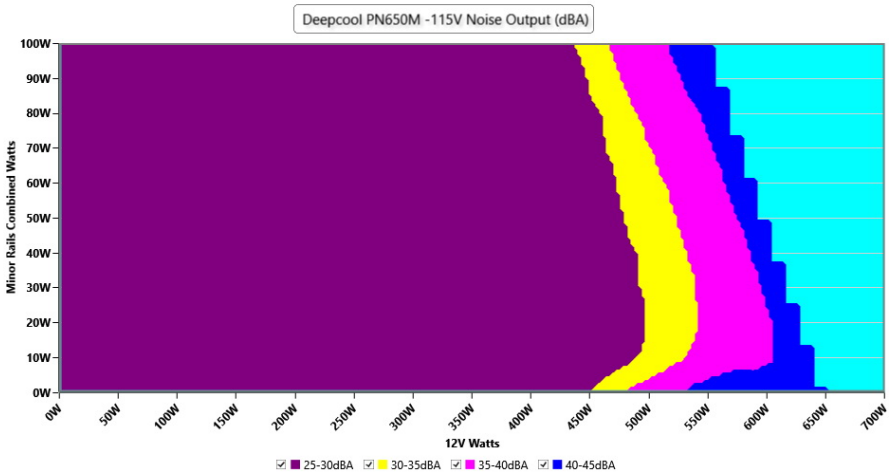
EFFICIENCY GRAPH 115V



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:	114.87 V	114.82 V	113.85 V	114.90 V	116.15 V	PASS
Mains Frequency:	60.01 Hz	59.98 Hz	59.40 Hz	60.05 Hz	60.60 Hz	PASS
Mains Voltage CF:	1.418	1.417	1.340	1.420	1.490	PASS
Mains Voltage THD:	0.15 %	0.11 %	N/A	0.20 %	2.00 %	PASS
Real Power:	0.039 W	-0.003 W	N/A	0.073 W	N/A	N/A
Apparent Power:	11.455 W	11.427 W	N/A	11.488 W	N/A	N/A
Power Factor:	0.004	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%	3.582A	1.999A	1.972A	0.991A	65.001	85.018%	1127	26.9	40.03°C	0.954
	12.114V	5.002V	3.347V	5.045V	76.455				44.25°C	114.83V
20%	8.180A	3.003A	2.959A	1.194A	129.929	88.957%	1131	27.0	40.82°C	0.972
	12.107V	4.995V	3.345V	5.027V	146.057				45.34°C	114.81V
30%	13.131A	3.507A	3.455A	1.397A	194.93	90.183%	1135	27.0	41.08°C	0.979
	12.099V	4.99V	3.343V	5.012V	216.149				46.09°C	114.79V
40%	18.096A	4.013A	3.952A	1.602A	260.014	90.387%	1137	27.1	41.85°C	0.983
	12.092V	4.984V	3.34V	4.996V	287.667				47.39°C	114.77V
50%	22.716A	5.023A	4.942A	1.808A	325.006	90.132%	1142	27.2	42.17°C	0.984
	12.084V	4.977V	3.339V	4.978V	360.589				48.24°C	114.74V
60%	27.290A	6.035A	5.933A	2A	389.272	89.632%	1145	27.4	42.74°C	0.984
	12.075V	4.972V	3.338V	4.961V	434.297				49.33°C	114.73V
70%	31.948A	7.049A	6.923A	2.226A	454.662	88.923%	1203	28.5	43.34°C	0.983
	12.068V	4.966V	3.337V	4.942V	511.302				50.41°C	114.7V
80%	36.614A	8.066A	7.915A	2.334A	519.459	87.971%	1731	39.7	43.74°C	0.984
	12.060V	4.958V	3.335V	4.928V	590.489				51.75°C	114.68V
90%	41.688A	8.584A	8.405A	2.442A	584.886	87.185%	2199	45.5	44.46°C	0.986
	12.051V	4.951V	3.331V	4.914V	670.858				53.53°C	114.66V
100%	46.504A	9.102A	8.925A	3.073A	649.717	86.279%	2355	48.7	45.5°C	0.987
	12.042V	4.944V	3.327V	4.882V	753.038				55.53°C	114.62V
110%	51.193A	10.128A	10.011A	3.081A	714.355	85.214%	2352	48.6	46.72°C	0.988
	12.034V	4.936V	3.326V	4.87V	838.305				57.56°C	114.61V
CL1	0.115A	12.086A	11.749A	0A	101.292	82.637%	1155	27.6	41.87°C	0.967
	12.110V	4.981V	3.379V	5.059V	122.579				47.33°C	114.82V
CL2	0.114A	20.042A	0A	0A	101.335	79.271%	1170	27.9	40.43°C	0.968
	12.116V	4.987V	3.334V	5.064V	127.835				47.47°C	114.82V
CL3	0.114A	0A	19.27A	0A	67.382	76.646%	1136	27.1	40.98°C	0.956
	12.115V	5.016V	3.425V	5.066V	87.911				49.99°C	114.84V
CL4	53.884A	0A	0A	0A	649.55	87.663%	2368	49.1	45.18°C	0.987
	12.055V	4.983V	3.311V	5.001V	740.969				56.08°C	114.64V

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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	1.225A	0.499A	0.493A	0.197A	19.997	71.1%	1115	26.7	36.6°C	0.84
	12.119V	5.01V	3.346V	5.081V	28.126				39.7°C	114.84V
40W	2.698A	0.699A	0.691A	0.296A	39.998	81.225%	1118	26.8	37.36°C	0.922
	12.117V	5.007V	3.345V	5.075V	49.244				40.69°C	114.84V
60W	4.170A	0.899A	0.888A	0.395A	59.998	85.184%	1121	26.8	38.21°C	0.946
	12.115V	5.005V	3.344V	5.068V	70.435				41.99°C	114.83V
80W	5.640A	1.099A	1.086A	0.494A	79.94	87.206%	1123	26.9	39.3°C	0.956
	12.113V	5.004V	3.344V	5.061V	91.666				43.25°C	114.83V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	15.50mV	12.37mV	15.75mV	12.83mV	Pass
20% Load	17.39mV	11.55mV	15.08mV	9.44mV	Pass
30% Load	19.28mV	12.16mV	16.26mV	14.16mV	Pass
40% Load	21.54mV	12.27mV	15.80mV	10.52mV	Pass
50% Load	20.31mV	11.91mV	16.42mV	12.11mV	Pass
60% Load	19.64mV	12.22mV	16.62mV	13.34mV	Pass
70% Load	18.82mV	13.50mV	18.27mV	19.03mV	Pass
80% Load	20.00mV	13.70mV	19.29mV	16.57mV	Pass
90% Load	19.69mV	12.63mV	18.01mV	14.32mV	Pass
100% Load	30.32mV	13.14mV	23.07mV	17.43mV	Pass
110% Load	31.15mV	13.10mV	22.65mV	17.05mV	Pass
Crossload1	27.18mV	13.61mV	22.25mV	9.83mV	Pass
Crossload2	19.64mV	20.84mV	22.83mV	9.39mV	Pass
Crossload3	17.49mV	12.01mV	19.44mV	8.16mV	Pass
Crossload4	29.26mV	13.39mV	19.70mV	12.41mV	Pass

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230V

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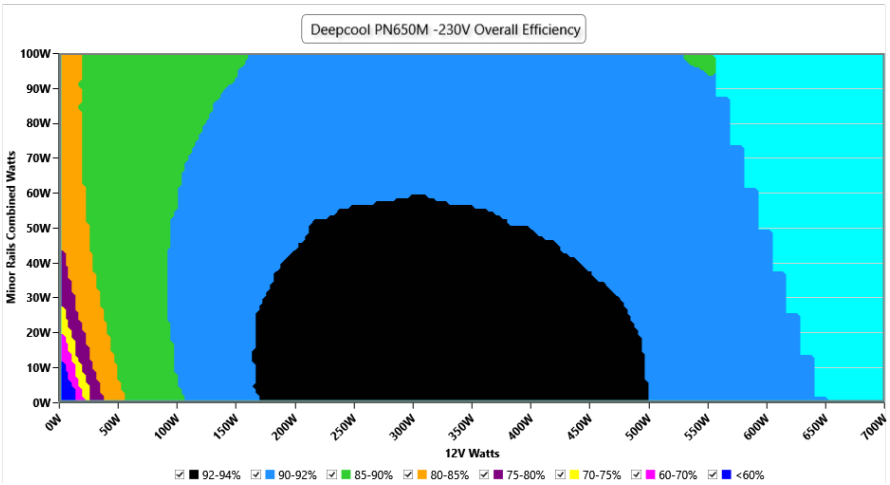
EFFICIENCY GRAPH 230V



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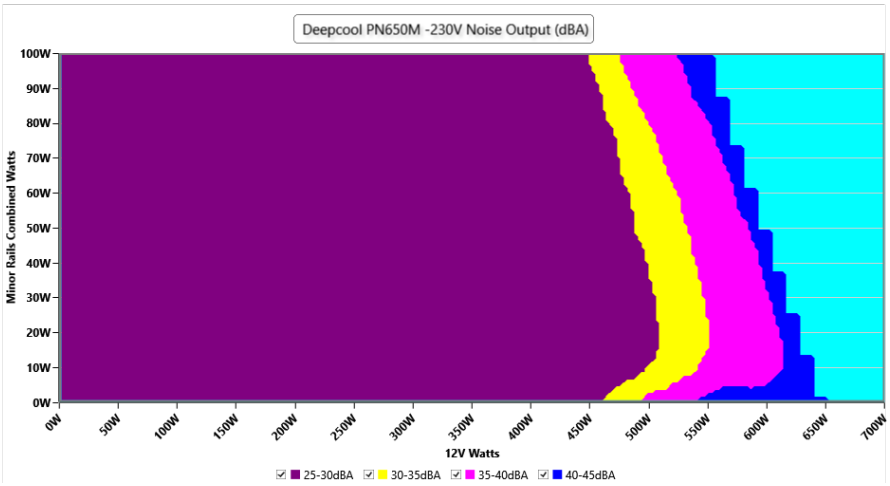
NOISE GRAPH 230V



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VAMPIRE POWER -230V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	229.88 V	229.82 V	227.70 V	229.95 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:	1.418	1.417	1.340	1.418	1.490	PASS
Mains Voltage THD:	0.16 %	0.14 %	N/A	0.19 %	2.00 %	PASS
Real Power:	0.111 W	0.072 W	N/A	0.154 W	N/A	N/A
Apparent Power:	39.731 W	39.679 W	N/A	39.792 W	N/A	N/A
Power Factor:	0.003	N/A	N/A	N/A	N/A	N/A

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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%	3.582A	1.998A	1.971A	0.991A	65	85.815%	1131	27.0	40.17°C	0.77
	12.117V	5.005V	3.348V	5.045V	75.746				44.44°C	229.85V
20%	8.178A	3.001A	2.958A	1.193A	129.93	90.293%	1133	27.0	40.79°C	0.887
	12.109V	4.999V	3.347V	5.028V	143.898				45.29°C	229.84V
30%	13.130A	3.504A	3.452A	1.397A	194.933	91.69%	1137	27.1	41.33°C	0.924
	12.101V	4.994V	3.346V	5.012V	212.6				46.34°C	229.83V
40%	18.092A	4.008A	3.948A	1.601A	260.01	92.157%	1139	27.1	41.81°C	0.941
	12.094V	4.99V	3.344V	4.997V	282.135				47.39°C	229.82V
50%	22.711A	5.016A	4.936A	1.807A	324.984	92.162%	1142	27.2	42.28°C	0.951
	12.086V	4.984V	3.343V	4.981V	352.622				48.26°C	229.81V
60%	27.278A	6.025A	5.923A	2A	389.204	91.94%	1146	27.4	42.82°C	0.958
	12.078V	4.98V	3.343V	4.963V	423.321				49.35°C	229.8V
70%	31.938A	7.036A	6.91A	2.224A	454.606	91.588%	1150	27.5	43.29°C	0.963
	12.070V	4.975V	3.343V	4.945V	496.357				50.39°C	229.79V
80%	36.604A	8.051A	7.899A	2.332A	519.413	90.978%	1668	38.9	43.78°C	0.966
	12.062V	4.968V	3.342V	4.931V	570.926				51.86°C	229.78V
90%	41.676A	8.565A	8.386A	2.44A	584.854	90.48%	2177	45.4	44.09°C	0.968
	12.054V	4.961V	3.339V	4.917V	646.392				53.17°C	229.76V
100%	46.490A	9.082A	8.904A	3.07A	649.684	89.908%	2353	48.6	45.28°C	0.97
	12.045V	4.955V	3.335V	4.886V	722.608				55.38°C	229.75V
110%	51.175A	10.105A	9.987A	3.077A	714.296	89.385%	2352	48.6	46.78°C	0.972
	12.037V	4.948V	3.334V	4.874V	799.127				57.72°C	229.74V
CL1	0.114A	12.073A	11.745A	0A	101.285	83.691%	1155	27.6	41.28°C	0.863
	12.112V	4.986V	3.38V	5.06V	121.023				46.84°C	229.84V
CL2	0.114A	20.027A	0A	0A	101.328	80.265%	1170	27.9	40.03°C	0.87
	12.117V	4.99V	3.337V	5.066V	126.242				47.05°C	229.84V
CL3	0.114A	0A	19.27A	0A	67.378	77.463%	1133	27.0	40.07°C	0.803
	12.115V	5.017V	3.425V	5.068V	86.981				49.11°C	229.85V
CL4	53.873A	0A	0A	0A	649.499	91.228%	2370	49.1	44.83°C	0.97
	12.056V	4.989V	3.317V	5.004V	711.955				55.8°C	229.75V

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Anex

Deepcool PN650M

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	1.225A	0.499A	0.493A	0.197A	19.995	71.042%	1117	26.8	36.85°C	0.46
	12.120V	5.011V	3.346V	5.081V	28.146				39.93°C	229.86V
40W	2.698A	0.699A	0.69A	0.296A	39.996	81.702%	1118	26.8	37.23°C	0.646
	12.118V	5.009V	3.346V	5.075V	48.951				40.53°C	229.85V
60W	4.170A	0.898A	0.888A	0.395A	59.996	85.923%	1122	26.9	38.08°C	0.749
	12.116V	5.008V	3.345V	5.069V	69.823				41.53°C	229.85V
80W	5.638A	1.098A	1.085A	0.494A	79.936	88.196%	1126	26.9	39.21°C	0.814
	12.115V	5.006V	3.345V	5.062V	90.636				43.082°C	229.85V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	14.78mV	12.78mV	15.65mV	12.47mV	Pass
20% Load	16.52mV	11.96mV	15.13mV	9.44mV	Pass
30% Load	19.85mV	11.91mV	15.80mV	14.16mV	Pass
40% Load	28.08mV	14.37mV	29.04mV	17.04mV	Pass
50% Load	21.02mV	12.52mV	17.91mV	12.42mV	Pass
60% Load	18.92mV	13.45mV	18.11mV	13.75mV	Pass
70% Load	18.05mV	12.62mV	17.75mV	18.32mV	Pass
80% Load	20.76mV	13.14mV	19.60mV	17.91mV	Pass
90% Load	19.39mV	13.86mV	19.91mV	15.13mV	Pass
100% Load	29.80mV	14.57mV	21.50mV	15.70mV	Pass
110% Load	31.57mV	14.46mV	22.42mV	16.73mV	Pass
Crossload1	27.61mV	14.07mV	23.32mV	9.77mV	Pass
Crossload2	19.84mV	19.96mV	23.96mV	9.85mV	Pass
Crossload3	16.98mV	12.68mV	21.39mV	8.77mV	Pass
Crossload4	29.52mV	13.69mV	18.59mV	12.33mV	Pass

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Anex

Deepcool PN650M

Top side

Power specifications label

CERTIFICATIONS 115V

CERTIFICATIONS 230V

Aristeidis Bitziopoulos
Lab Director

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