

Anex

Deepcool PN650D

Lab ID#: DC65002339
 Receipt Date: Jan 11, 2024
 Test Date: Jan 29, 2024

Report: 24PS2339A
 Report Date: Jan 31, 2024

DUT INFORMATION	
Brand	Deepcool
Manufacturer (OEM)	CWT
Series	PN-D
Model Number	PN650D-FC
Serial Number	
DUT Notes	CWT GPW platform

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	X
Cable Design	Fixed cables

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	88.383%
Efficiency With 10W (≤500W) or 2% (>500W)	64.444
Average Efficiency 5VSB	78.607%
Standby Power Consumption (W)	0.0538000
Average PF	0.980
Avg Noise Output	34.21 dB(A)
Efficiency Rating (ETA)	GOLD
Noise Rating (LAMBDA)	Standard++

230V

Average Efficiency	90.530%
Average Efficiency 5VSB	78.044%
Standby Power Consumption (W)	0.1183000
Average PF	0.935
Avg Noise Output	34.27 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)	16.2
AC Loss to PWR_OK Hold Up Time (ms)	15
PWR_OK Inactive to DC Loss Delay (ms)	1.2

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CABLES AND CONNECTORS

Captive Cables

Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (550mm)	1	1	18-20AWG	No
4+4 pin EPS12V (730mm+150mm)	1	2	18AWG	No
6+2 pin PCIe (590mm+120mm)	1	2	18AWG	No
6+2 pin PCIe (590mm)	1	1	18AWG	No
12+4 pin PCIe (610mm) (450W)	1	1	16-24AWG	No
SATA (450mm+120mm+120mm) / 4-pin Molex (+120mm)	2	6 / 2	18AWG	No

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Anex

Deepcool PN650D

General Data	
Manufacturer (OEM)	CWT
Platform	GPW
PCB Type	Single-Sided
Primary Side	
Transient Filter	2x Y caps, 1x X caps, 2x CM chokes, 1x MOV. 1x CAP200DG (Discharge IC)
Inrush Protection	1x NTC Thermistor SCK-056 (5 Ohm @25°C) & Relay
Bridge Rectifier(s)	1x GBU1006 (600V, 10A @ 150°C)
APFC MOSFETs	2x Champion GPT22N50SYX & 1x Sync Power SPN5003 (for reducing the no-load consumption)
APFC Boost Diode	1x CRMICRO CRXI06D065G2 (600V, 6A @ 167°C)
Bulk Cap(s)	1x Chengx (400V, 560uF, 2000h @ 85°C, AP)
Main Switchers	4x Silan Microelectronics SVF13N50F (500V, 8.2A @ 100°C, Rds(on): 0.52Ohm)
Resonant Controller	Champion CM6901X
APFC Controller	Champion 6500UNX
Topology	Primary side: APFC, Full-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETs	4 x InPower Semiconductor FTG014N04SA (40V, 100A)
5V & 3.3V	DC-DC Converters: 4x SPN3006 (30V, 57A @ 100°C, Rds(on): 5.5mOhm) PWM Controller(s): 1x ANPEC APW7159
Filtering Capacitors	Electrolytic: 11x Chengx (2-4,000 @ 105°C, GR), Polymer: 9x CapXon , 3x Chengx , 3x Elite , 2x Apaq
Supervisor IC	INI1S429I - DCG
Fan Model	Martech DF1202512SEHN (120mm, 12V, 0.42A, Fluid Dynamic Bearing Fan)
5VSB Circuit	
Standby PWM Controller	Power Integrations TNY290

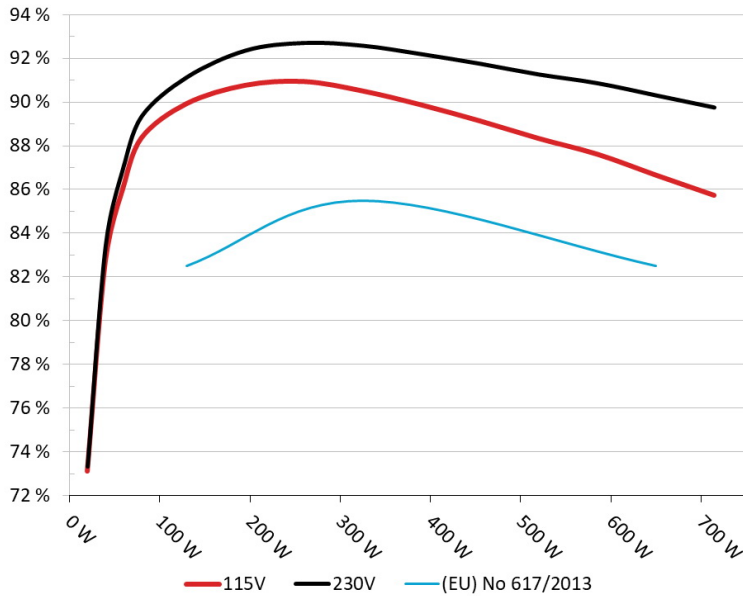
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EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

Efficiency: Deepcool PN650D
Ambient: 37°C - 47°C (98.6°F - 116.6°F)

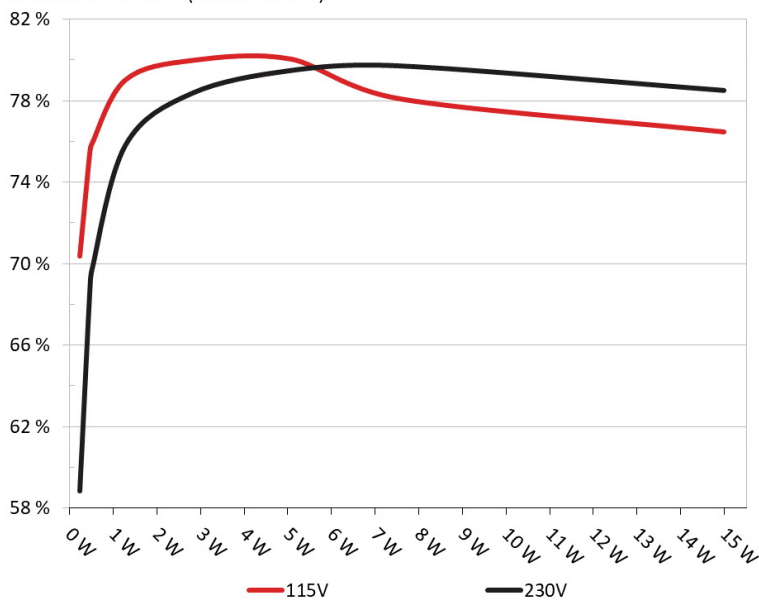


INFO

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: Deepcool PN650D
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

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.23W	69.872%	0.033
	5.099V	0.329W		115.16V
2	0.09A	0.459W	74.972%	0.061
	5.097V	0.612W		115.17V
3	0.55A	2.796W	79.492%	0.269
	5.081V	3.517W		115.16V
4	1A	5.067W	79.56%	0.366
	5.065V	6.369W		115.16V
5	1.5A	7.575W	77.601%	0.417
	5.049V	9.762W		115.16V
6	3A	14.985W	75.98%	0.481
	4.995V	19.721W		115.16V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.23W	58.344%	0.012
	5.097V	0.394W		230.4V
2	0.09A	0.459W	68.155%	0.02
	5.096V	0.674W		230.4V
3	0.55A	2.795W	77.856%	0.103
	5.081V	3.591W		230.4V
4	1A	5.067W	78.984%	0.171
	5.065V	6.414W		230.4V
5	1.5A	7.573W	79.206%	0.23
	5.047V	9.562W		230.4V
6	3.001A	14.983W	78.005%	0.334
	4.994V	19.207W		230.4V

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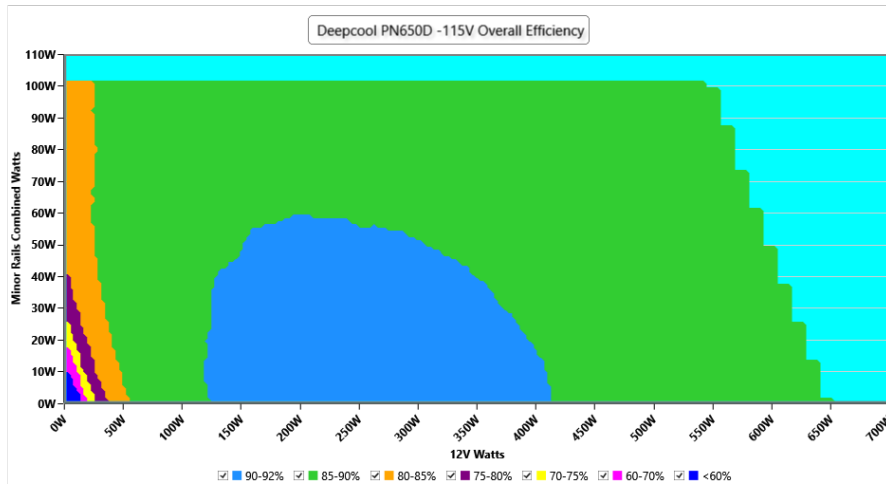
115V

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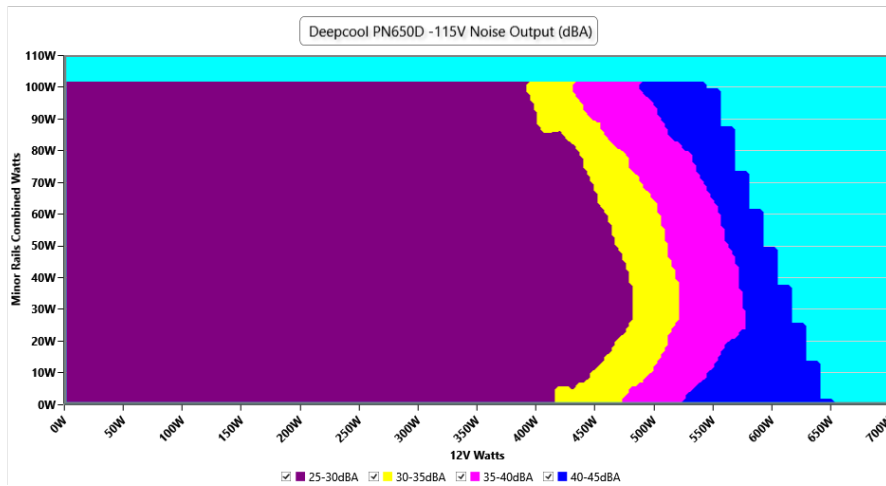
EFFICIENCY GRAPH 115V



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:	115.13 V	115.11 V	113.85 V	115.16 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:	1.415	1.415	1.340	1.416	1.490	PASS
Mains Voltage THD:	0.13 %	0.11 %	N/A	0.15 %	2.00 %	PASS
Real Power:	0.054 W	0.048 W	N/A	0.061 W	N/A	N/A
Apparent Power:	9.899 W	9.895 W	N/A	9.903 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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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	1.975A	1.966A	0.99A	65.008	85.635%	1101	26.7	40.34°C	0.954
	12.115V	5.064V	3.357V	5.051V	75.914				44.62°C	115.15V
20%	8.180A	2.964A	2.952A	1.192A	129.961	89.429%	1104	26.7	40.64°C	0.973
	12.108V	5.062V	3.354V	5.034V	145.324				45.18°C	115.13V
30%	13.132A	3.46A	3.446A	1.396A	194.969	90.268%	1107	26.7	41.37°C	0.98
	12.101V	5.06V	3.352V	5.016V	215.99				46.44°C	115.11V
40%	18.095A	3.955A	3.941A	1.601A	260.058	90.442%	1110	26.7	41.92°C	0.983
	12.095V	5.058V	3.35V	4.998V	287.541				47.43°C	115.09V
50%	22.712A	4.945A	4.929A	1.808A	325.053	90.009%	1246	30.1	42.13°C	0.983
	12.088V	5.056V	3.348V	4.979V	361.133				48.15°C	115.08V
60%	27.302A	5.937A	5.92A	2.001A	389.489	89.379%	1679	39.0	42.92°C	0.984
	12.078V	5.054V	3.345V	4.961V	435.776				49.49°C	115.06V
70%	31.964A	6.929A	6.912A	2.226A	454.877	88.64%	2073	44.6	43.26°C	0.984
	12.068V	5.052V	3.343V	4.942V	513.179				50.31°C	115.03V
80%	36.631A	7.921A	7.904A	2.334A	519.68	87.839%	2281	46.6	43.66°C	0.985
	12.061V	5.05V	3.34V	4.927V	591.629				51.75°C	115.01V
90%	41.694A	8.418A	8.387A	2.443A	585.09	87.116%	2281	46.6	44.94°C	0.986
	12.054V	5.049V	3.338V	4.912V	671.627				54.03°C	114.99V
100%	46.498A	8.914A	8.901A	3.077A	649.926	86.161%	2283	46.6	45.5°C	0.987
	12.048V	5.049V	3.336V	4.876V	754.316				55.58°C	114.97V
110%	51.180A	9.908A	9.988A	3.084A	714.56	85.234%	2287	46.6	46.76°C	0.989
	12.041V	5.046V	3.334V	4.864V	838.371				57.69°C	114.95V
CL1	0.116A	11.909A	11.85A	0A	101.298	83.555%	1121	26.8	41.32°C	0.972
	12.111V	5.055V	3.35V	5.064V	121.235				46.81°C	115.14V
CL2	0.115A	19.78A	0A	0A	101.394	81.606%	1127	26.9	41.31°C	0.973
	12.116V	5.055V	3.364V	5.072V	124.25				48.41°C	115.14V
CL3	0.115A	0A	19.713A	0A	67.391	76.533%	1109	26.7	40.99°C	0.963
	12.115V	5.075V	3.348V	5.069V	88.055				50.1°C	115.15V
CL4	53.909A	0A	0A	0A	649.711	87.386%	2288	46.7	45.46°C	0.988
	12.052V	5.064V	3.348V	5.004V	743.502				56.4°C	114.98V

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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	1.226A	0.494A	0.491A	0.197A	20.008	72.605%	1088	26.4	36.65°C	0.858
	12.111V	5.064V	3.358V	5.088V	27.557				39.72°C	115.17V
40W	2.700A	0.691A	0.688A	0.295A	40.005	82.214%	1091	26.5	37.43°C	0.927
	12.110V	5.064V	3.357V	5.082V	48.66				40.76°C	115.16V
60W	4.173A	0.889A	0.885A	0.394A	60.004	85.939%	1094	26.5	38.35°C	0.952
	12.110V	5.064V	3.357V	5.075V	69.823				42.09°C	115.15V
80W	5.644A	1.086A	1.081A	0.493A	79.97	87.861%	1097	26.6	39.31°C	0.965
	12.110V	5.064V	3.357V	5.069V	91.021				43.29°C	115.15V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	11.87mV	7.96mV	6.00mV	5.40mV	Pass
20% Load	15.13mV	8.37mV	7.88mV	5.76mV	Pass
30% Load	16.81mV	9.13mV	8.09mV	7.24mV	Pass
40% Load	18.79mV	9.38mV	7.38mV	6.98mV	Pass
50% Load	18.49mV	14.13mV	7.58mV	8.05mV	Pass
60% Load	16.94mV	16.98mV	8.59mV	9.58mV	Pass
70% Load	15.88mV	18.36mV	9.20mV	10.95mV	Pass
80% Load	16.69mV	11.88mV	10.68mV	9.07mV	Pass
90% Load	17.71mV	12.81mV	11.24mV	9.12mV	Pass
100% Load	28.44mV	14.26mV	13.03mV	11.06mV	Pass
110% Load	29.80mV	16.37mV	17.65mV	12.24mV	Pass
Crossload1	22.96mV	14.15mV	10.88mV	7.39mV	Pass
Crossload2	17.45mV	18.57mV	10.02mV	7.69mV	Pass
Crossload3	20.35mV	10.10mV	15.41mV	5.91mV	Pass
Crossload4	27.14mV	16.43mV	10.06mV	12.79mV	Pass

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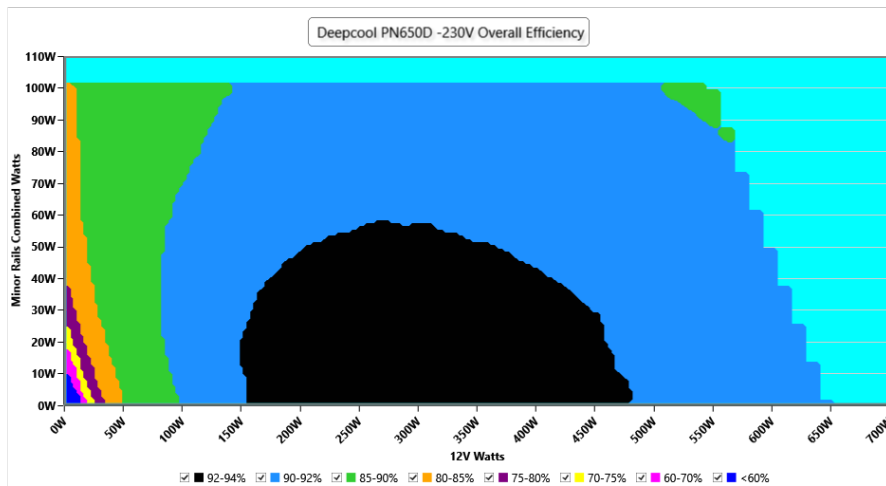
230V

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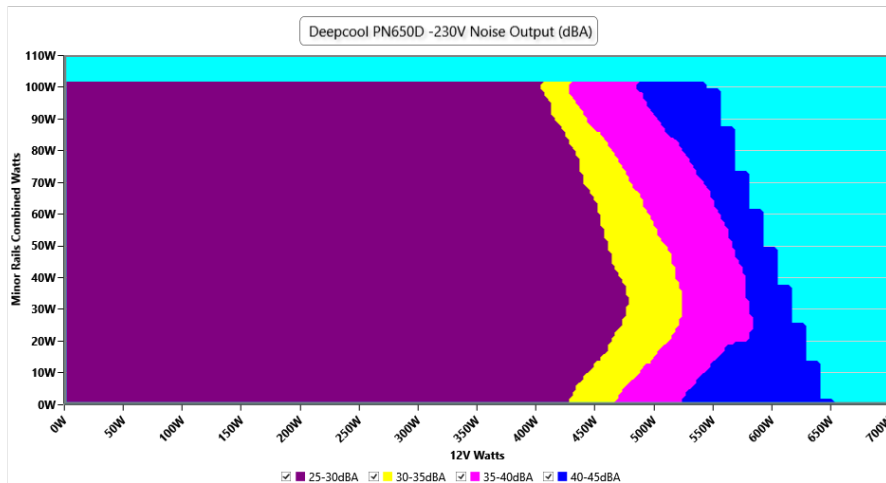
EFFICIENCY GRAPH 230V



INFO

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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

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VAMPIRE POWER -230V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	230.37 V	230.34 V	227.70 V	230.39 V	232.30 V	PASS
Mains Frequency:	50.00 Hz	50.00 Hz	49.50 Hz	50.00 Hz	50.50 Hz	PASS
Mains Voltage CF:	1.415	1.415	1.340	1.415	1.490	PASS
Mains Voltage THD:	0.14 %	0.13 %	N/A	0.16 %	2.00 %	PASS
Real Power:	0.118 W	0.103 W	N/A	0.147 W	N/A	N/A
Apparent Power:	33.104 W	33.091 W	N/A	33.115 W	N/A	N/A
Power Factor:	0.004	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	1.975A	1.966A	0.99A	65.003	86.581%	1100	26.7	40.27°C	0.79
	12.116V	5.064V	3.357V	5.052V	75.074				44.48°C	230.37V
20%	8.180A	2.964A	2.952A	1.192A	129.945	90.64%	1104	26.7	40.83°C	0.894
	12.108V	5.061V	3.354V	5.034V	143.364				45.33°C	230.36V
30%	13.130A	3.459A	3.446A	1.396A	194.95	91.863%	1107	26.7	41.37°C	0.929
	12.101V	5.06V	3.352V	5.017V	212.219				46.38°C	230.36V
40%	18.093A	3.955A	3.94A	1.601A	260.034	92.212%	1110	26.7	41.63°C	0.944
	12.095V	5.058V	3.35V	4.999V	282				47.19°C	230.35V
50%	22.711A	4.945A	4.929A	1.808A	325.028	92.086%	1291	31.0	42.21°C	0.954
	12.088V	5.056V	3.348V	4.98V	352.962				48.29°C	230.35V
60%	27.296A	5.937A	5.919A	2A	389.421	91.701%	1663	38.8	42.95°C	0.96
	12.078V	5.055V	3.345V	4.962V	424.664				49.49°C	230.34V
70%	31.956A	6.929A	6.91A	2.226A	454.809	91.259%	2052	44.3	43.34°C	0.963
	12.069V	5.053V	3.343V	4.943V	498.374				50.38°C	230.33V
80%	36.622A	7.92A	7.903A	2.334A	519.607	90.772%	2276	46.5	43.72°C	0.966
	12.062V	5.05V	3.34V	4.928V	572.429				51.73°C	230.32V
90%	41.687A	8.417A	8.386A	2.443A	585.023	90.367%	2277	46.5	44.68°C	0.968
	12.055V	5.049V	3.338V	4.913V	647.381				53.76°C	230.31V
100%	46.493A	8.913A	8.9A	3.076A	649.864	89.812%	2280	46.6	45.99°C	0.97
	12.048V	5.049V	3.337V	4.877V	723.585				56.01°C	230.3V
110%	51.177A	9.908A	9.987A	3.084A	714.498	89.256%	2282	46.6	46.98°C	0.971
	12.040V	5.047V	3.334V	4.864V	800.506				57.92°C	230.29V
CL1	0.115A	11.906A	11.848A	0A	101.294	84.825%	1121	26.8	41.16°C	0.871
	12.111V	5.056V	3.351V	5.065V	119.42				46.61°C	230.36V
CL2	0.115A	19.783A	0A	0.002A	101.399	82.768%	1126	26.9	40.09°C	0.875
	12.115V	5.054V	3.364V	5.072V	122.512				47.16°C	230.36V
CL3	0.115A	0A	19.714A	0.001A	67.396	77.402%	1107	26.7	40.79°C	0.82
	12.112V	5.075V	3.347V	5.07V	87.074				49.82°C	230.37V
CL4	53.905A	0A	0A	0A	649.691	90.919%	2283	46.6	45.54°C	0.971
	12.052V	5.063V	3.347V	5.004V	714.585				56.5°C	230.3V

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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	1.226A	0.494A	0.491A	0.197A	20.002	72.815%	1090	26.5	36.85°C	0.51
	12.112V	5.065V	3.358V	5.089V	27.469				39.91°C	230.36V
40W	2.698A	0.691A	0.688A	0.295A	40	82.931%	1093	26.5	37.28°C	0.684
	12.113V	5.065V	3.358V	5.083V	48.232				40.56°C	230.36V
60W	4.172A	0.889A	0.884A	0.394A	59.998	86.856%	1095	26.6	38.92°C	0.771
	12.111V	5.065V	3.357V	5.076V	69.075				42.44°C	230.37V
80W	5.640A	1.086A	1.081A	0.493A	79.955	88.857%	1100	26.7	39.15°C	0.826
	12.112V	5.065V	3.357V	5.07V	89.982				42.98°C	230.36V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	12.21mV	12.45mV	10.93mV	11.21mV	Pass
20% Load	15.74mV	13.32mV	12.87mV	13.25mV	Pass
30% Load	18.27mV	14.23mV	14.09mV	16.86mV	Pass
40% Load	21.07mV	14.94mV	13.83mV	15.90mV	Pass
50% Load	22.18mV	27.14mV	13.43mV	20.63mV	Pass
60% Load	25.14mV	28.16mV	14.80mV	25.57mV	Pass
70% Load	25.44mV	30.81mV	15.82mV	26.14mV	Pass
80% Load	26.46mV	28.97mV	18.56mV	25.37mV	Pass
90% Load	27.42mV	20.96mV	19.68mV	23.74mV	Pass
100% Load	39.88mV	23.65mV	22.79mV	27.37mV	Pass
110% Load	42.11mV	27.08mV	25.76mV	27.73mV	Pass
Crossload1	34.45mV	30.92mV	21.02mV	19.22mV	Pass
Crossload2	27.94mV	34.38mV	17.95mV	21.55mV	Pass
Crossload3	31.09mV	18.36mV	30.06mV	12.84mV	Pass
Crossload4	35.22mV	28.92mV	18.49mV	22.31mV	Pass

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Anex

Deepcool PN650D

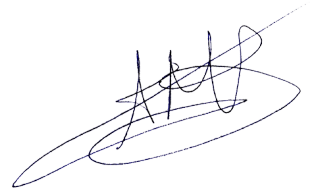


Top side



Power specifications label

CERTIFICATIONS 115V

Aristeidis Bitziopoulos
Lab Director

CERTIFICATIONS 230V



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