Enermax MaxRevo 1800W

Serial Number 18A7100210018

Lab ID EM19180019

Certification ID 25654

Test Result Report ID:

Certificate Issue Date: Mar 26, 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	Enermax
Model	MaxRevo 1800W
OEM/ODM	Enermax
Serial Number	18A7100210018
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	115-240
Rated Current (Arms)	16-8
Rated Frequency (Hz)	50-60

Rated Power (W)	1800
Operating Temperature (Continuous Full Load) (°C)	
Type	ATX12V
Cable Design	Fully Modular
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
Cooling	135mm Double Ball Bearing Fan (ADN512XB-A91)
Semi-Passive Operation	✗
Cybenetics Testing Information	
Lab ID	EM19180019
Date of receipt	Apr 4, 2019
Testing Date	Mar 26, 2019
Report Issued Date	Mar 26, 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) / 8 pin EPS12V (650mm)	1	1 / 1	16-22AWG	No
8 pin EPS12V (600mm) / 4 pin ATX (600)	1	1 / 1	16AWG	No
2 x 6+2 pin PCIe (500mm)	6	12	16-18AWG	No
SATA (450mm+150mm+150mm+150mm)	3	12	18AWG	No
SATA (450mm+150mm) / 4 pin Molex (+150mm+150mm)	1	2 / 2	18AWG	No
4 pin Molex (450mm+150mm+150mm+150mm) / FDD (+150mm)	2	8 / 2	18-20AWG	No
AC Power Cord (1444mm) - C14 coupler	1	1	14AWG	-

Power Specifications

Rail		3.3V	5V	12V(1)	12V(2)	12V(3)	12V(4)	12V(5)	12V(6)	5VSB	-12V
Max. Power	Amps	25	25	20	35	35	35	35	35	4	0.5
	Watts	140		1800						20	6
Total Max. Power (W)		1800									

Parts Description

General Data	
Manufacturer (OEM)	Enermax
PCB Type	Double Sided
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 3x CM chokes,1x DM chokes,1x MOV
Inrush Protection	NTC Thermistor & Relay
Bridge Rectifier(s)	1x Bridge
APFC MOSFETS	2x Infineon SPW35N60C3 (650V, 21.9A @ 100°C, 0.1Ohm)
APFC Boost Diode	1x CREE C3D10060A (600V, 14A @ 135°C)
Hold-up Cap(s)	3x Chemi-Con (420V, 390uF, 2000h @ 105°C, KMR)
Main Switchers	4x Toshiba TK18A60V (600V, 18A @ 150°C, 0.19Ohm)
IC Driver	Texas Instuments UCC27324
APFC Controller	Infineon 2PCS02 & CM03X Green PFC Controller
Main Controller	Texas Instuments UCC28950
Topology	Primary side: Interleaved PFC, Phase Shift ZVT Full-Bridge Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETS	8x Infineon IPP015N04N (40V, 120A @ 100°C, 1.5mOhm)
5V & 3.3V	DC-DC Converters: 8x Sinopower SM3116NAU (30V, 48A @ 100°C, 6.9mOhm @ 125°C) PWM Controllers: 2x ANPEC APW7073
Filtering Capacitors	Electrolytics: 8x Chemi-Con (4 - 10,000h @ 105°C, KY), 10x Rubycon (4 - 5,000h @ 105°C, ZLK) Polymers: 3x Elite (CS CAP), 8x Apaq
Supervisor IC	SITI PS238 (OCP, OVP, UVP, SCP, PG)
Fan Model	ADDA ADN512XB-A91 (135mm, 12V, 0.66A, Double Ball Bearing Fan)

5VSB Circuit	
Rectifier	TSF10U60C SBR (60V, 10A)
Standby PWM Controller	Power Integrations TOP265EG

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)	87.991%
Average Noise Output (>1450 Load Combinations)	43.20dBA
Average PF (>1450 Load Combinations)	0.998
Efficiency With 10W (≤500W) or 2% (>500W) Load	57.397%
Standby Power Consumption	0.0906W
Non-Accredited	
12V Ripple (Full Load)	30.69mV
5V Ripple (Full Load)	30.52mV
3.3V Ripple (Full Load)	41.44mV
5VSB Ripple (Full Load)	43.34mV
12V Load Regulation	2.13%
5V Load Regulation	1.41%
3.3V Load Regulation	1.65%
5VSB Load Regulation	3.18%
Inrush Current	21.327A

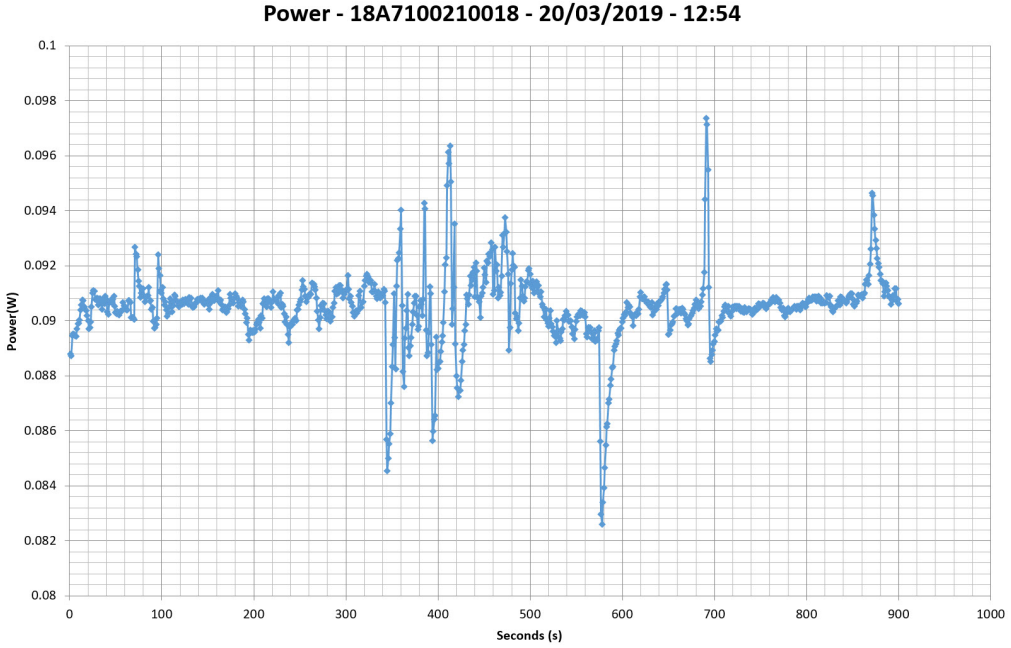
230V		
Accredited		
Average Efficiency (>1450 load combinations)	90.608%	
Average Noise Output (>1450 Load Combinations)	43.70dBA	
Average PF (>1450 Load Combinations)	0.988	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.1147W	
Non-Accredited		
12V Ripple (Full Load)	19.65mV	
5V Ripple (Full Load)	22.08mV	
3.3V Ripple (Full Load)	20.13mV	
5VSB Ripple (Full Load)	34.14mV	
12V Load Regulation	2.41%	
5V Load Regulation	1.59%	
3.3V Load Regulation	1.86%	
5VSB Load Regulation	3.40%	
Inrush Current	46.774A	
Hold-Up Time & PWR_OK Signal	12.50ms	
AC Loss to PWR_OK Hold Up Time	14.90ms	
PWR_OK Inactive to DC Loss Delay	-2.40ms	
OPP (0.00°C / 0.00°C)	106.33%	-

Hold-Up Time & PWR_OK Signal

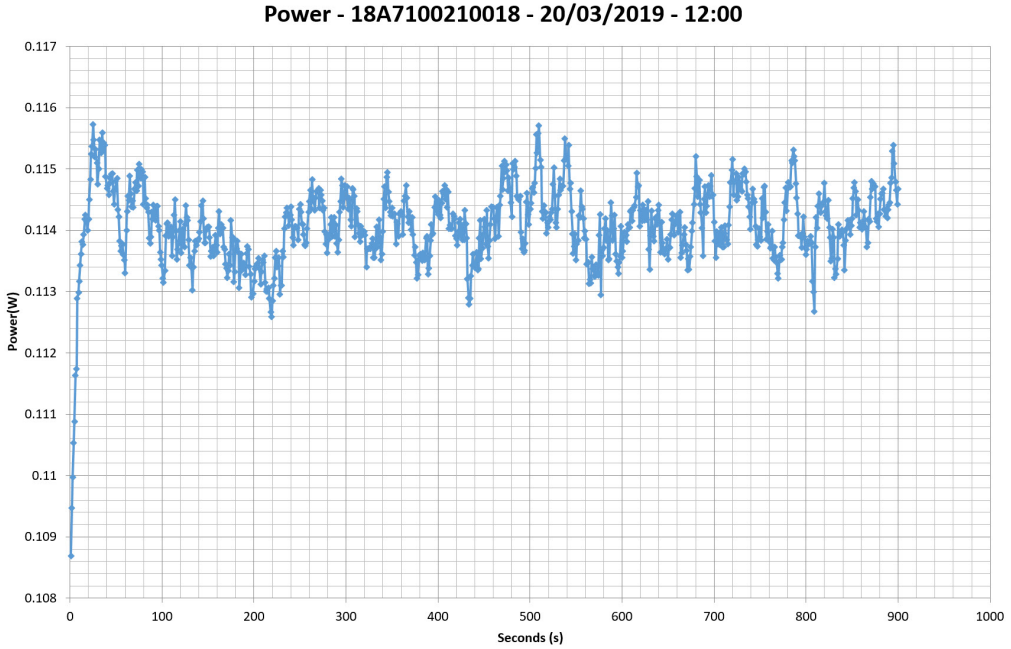
Hold-Up Time (ms)	12.5
AC Loss to PWR_OK Hold Up Time (ms)	14.9
PWR_OK Inactive to DC Loss Delay (ms)	-2.4

Graphs

115V



230V



Efficiency Graph

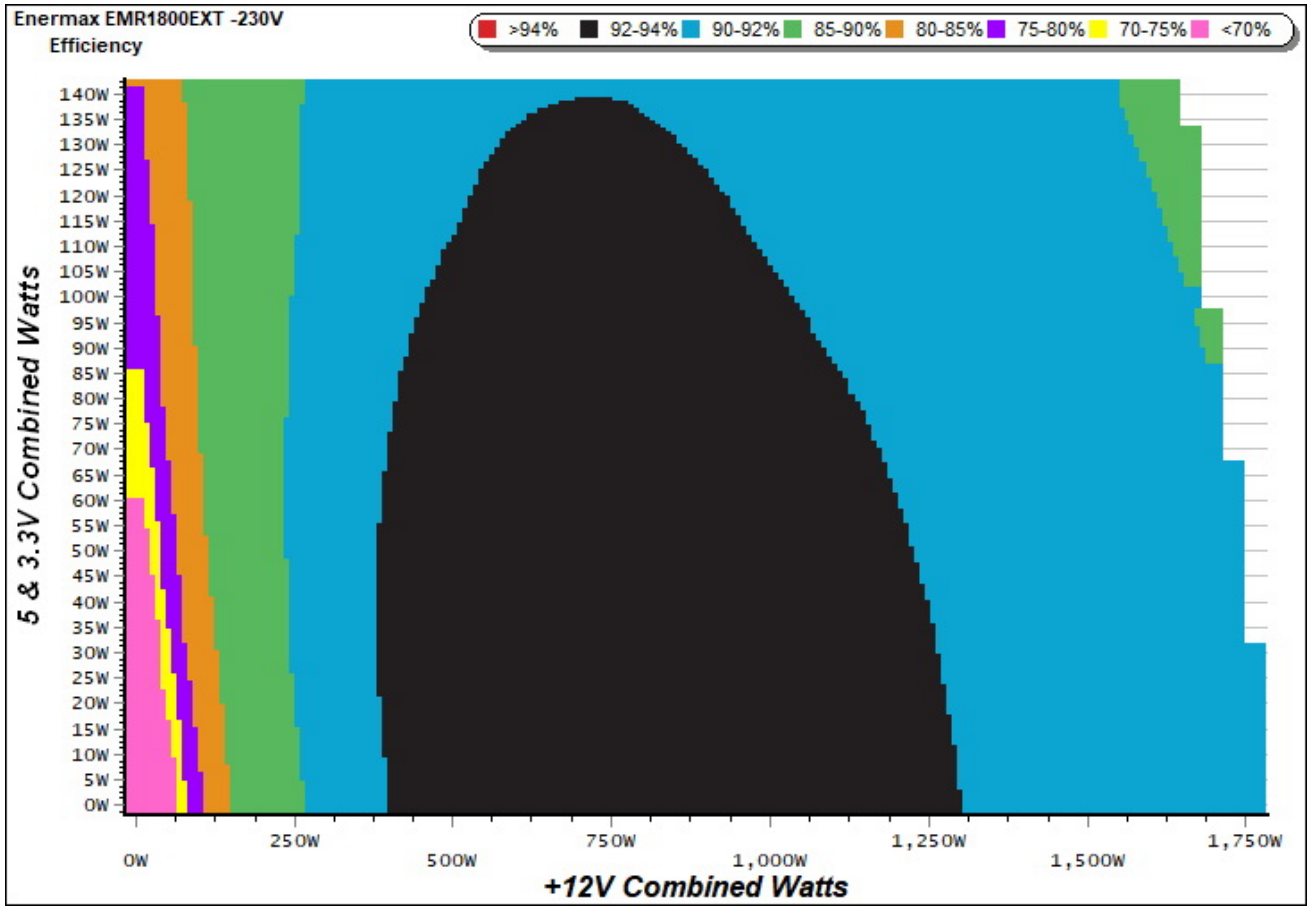
115V



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

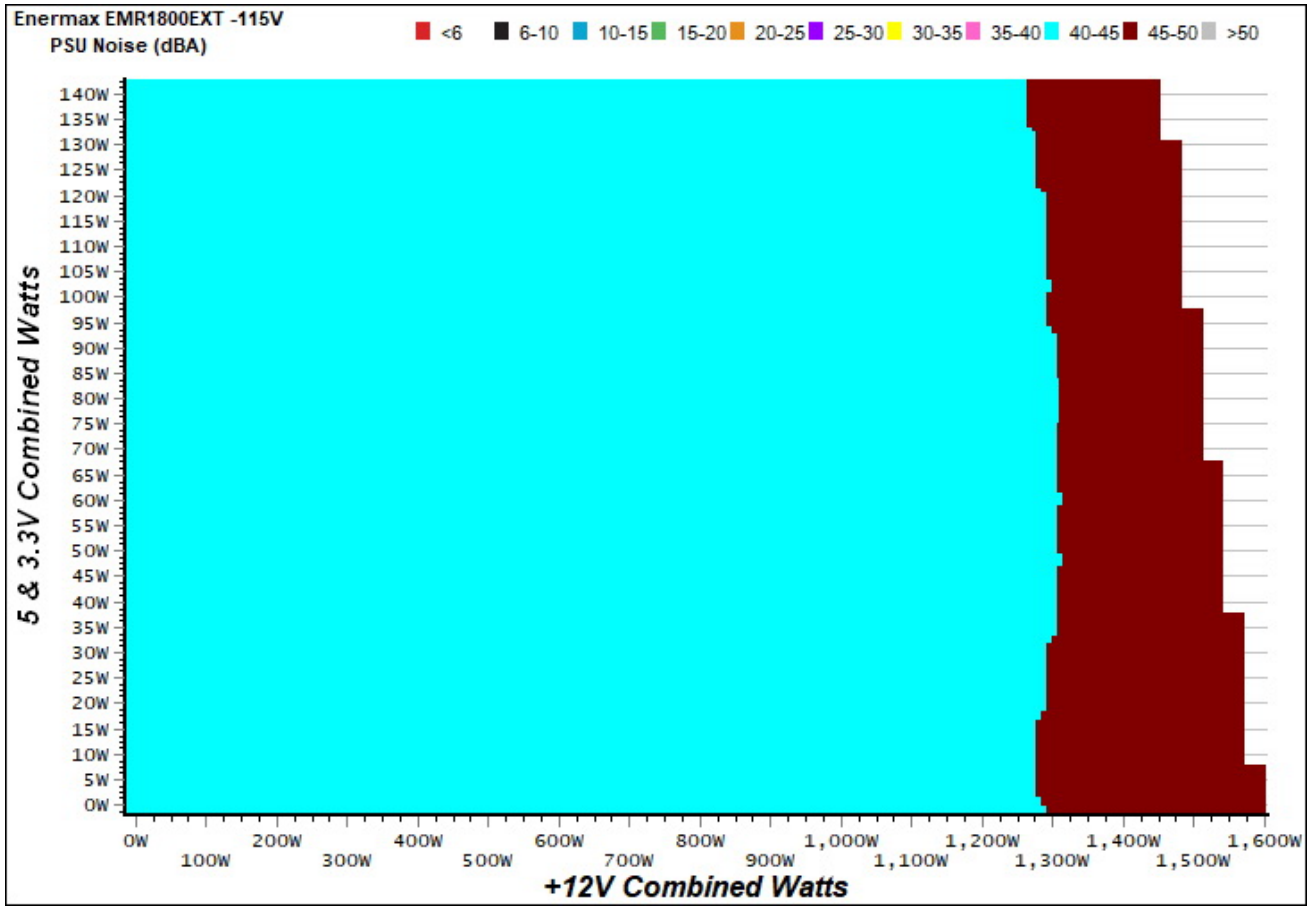


INFO

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Noise Graph

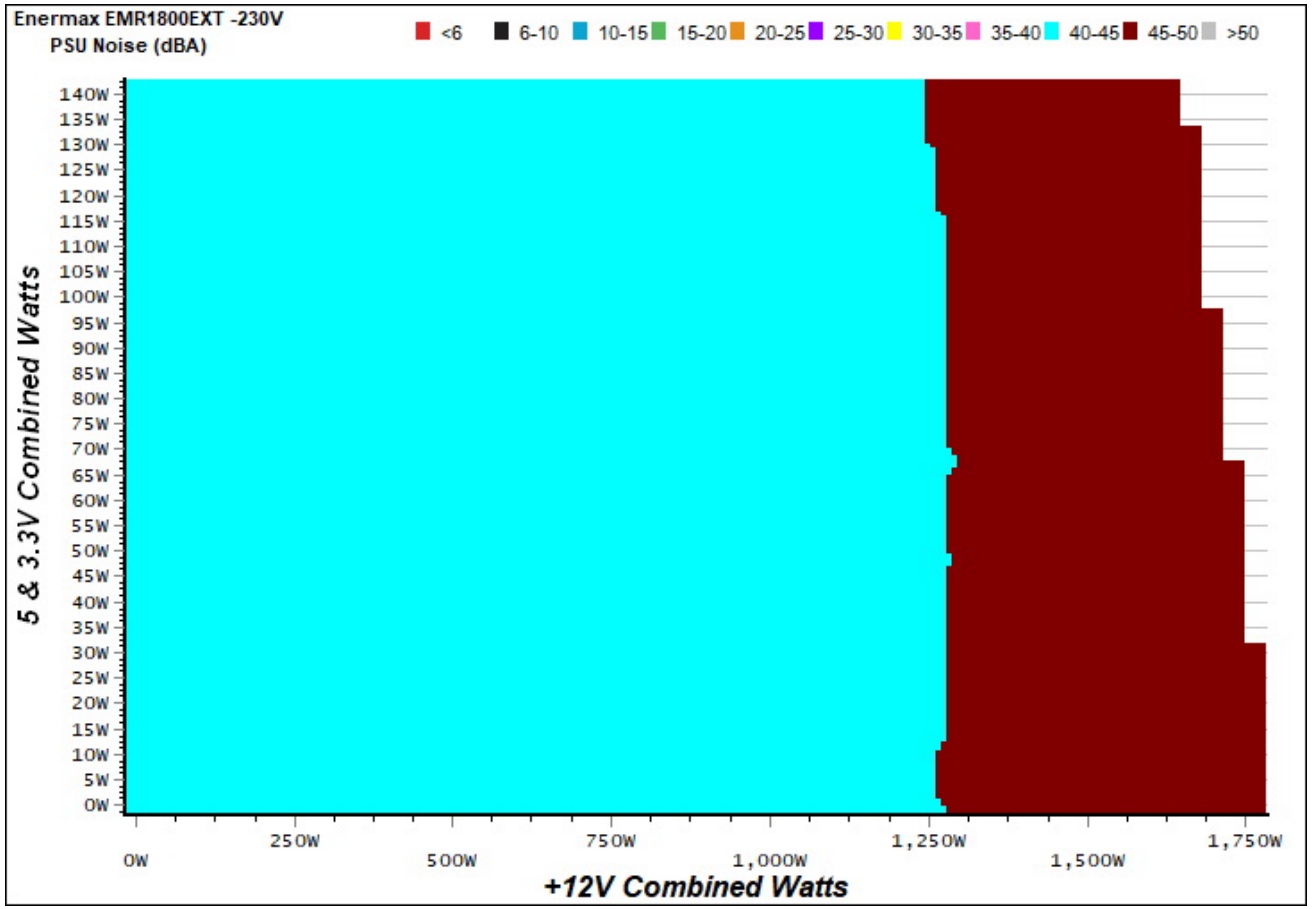
115V



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

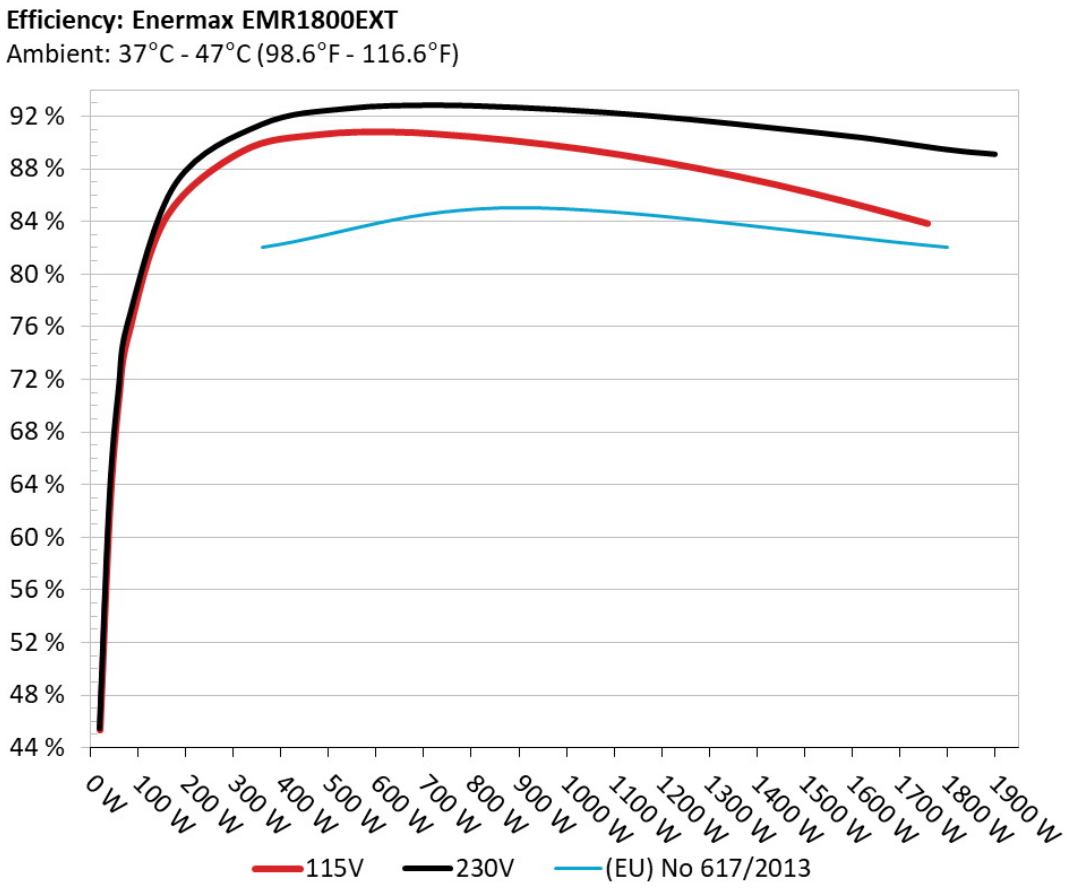


INFO

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

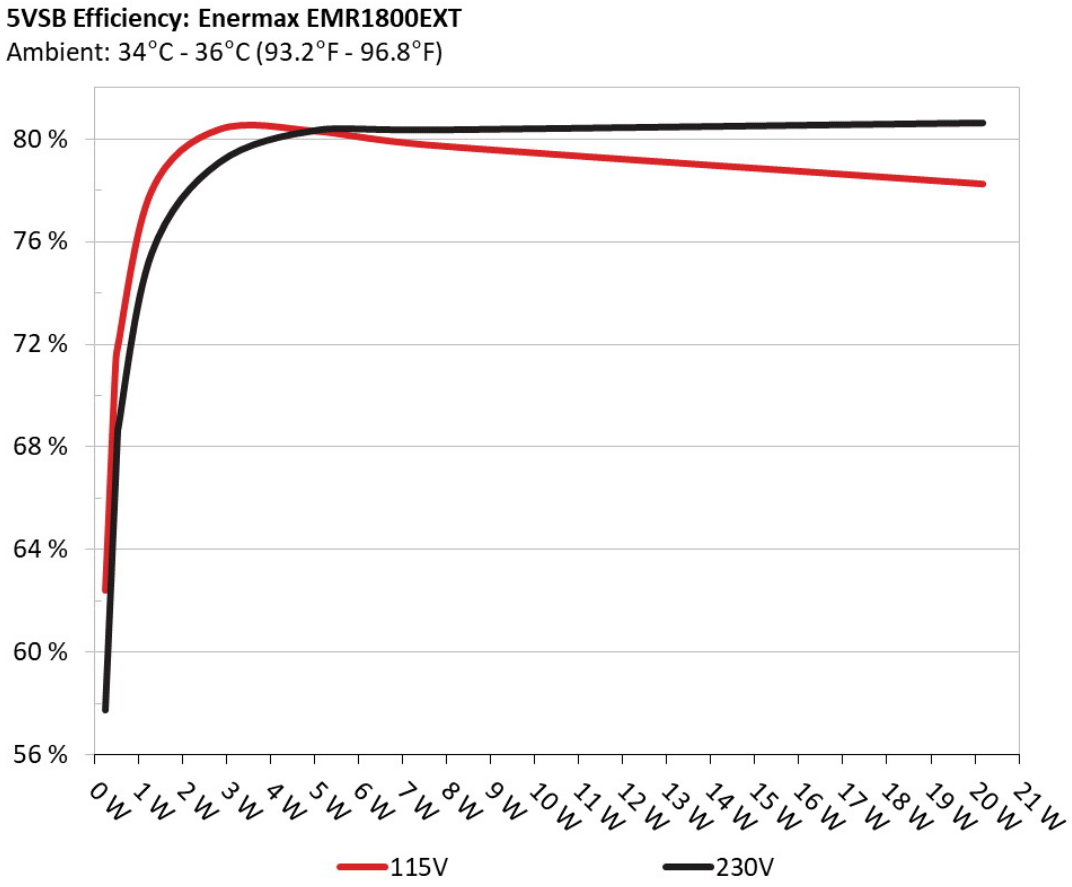
Efficiency under high ambient temperature



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	62.432%	0.059
	5.123V	0.370		115.09V
2	0.090A	0.461	71.142%	0.101
	5.122V	0.648		115.09V
3	0.550A	2.813	80.348%	0.340
	5.114V	3.501		115.08V
4	1.000A	5.106	80.270%	0.418
	5.106V	6.361		115.08V
5	1.500A	7.646	79.737%	0.459
	5.096V	9.589		115.08V
6	4.000A	20.186	78.231%	0.528
	5.047V	25.803		115.08V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.231	57.750%	0.017
	5.123V	0.400		230.25V
2	0.090A	0.462	68.648%	0.028
	5.122V	0.673		230.25V
3	0.550A	2.813	79.061%	0.141
	5.114V	3.558		230.25V
4	1.000A	5.106	80.346%	0.222
	5.105V	6.355		230.26V
5	1.500A	7.645	80.338%	0.285
	5.096V	9.516		230.26V
6	4.001A	20.188	80.610%	0.411
	5.046V	25.044		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	11.352A	1.963A	1.948A	0.981A	159.946	84.363%	1960	42.1	40.18°C	0.994
	12.188V	5.092V	3.385V	5.095V	189.592				42.36°C	115.10V
2	23.744A	2.950A	2.926A	1.181A	319.665	89.318%	1972	42.2	40.92°C	0.998
	12.162V	5.085V	3.379V	5.083V	357.896				43.50°C	115.11V
3	36.517A	3.446A	3.408A	1.381A	479.207	90.561%	1991	42.4	41.10°C	0.999
	12.137V	5.078V	3.374V	5.071V	529.152				44.20°C	115.11V
4	49.416A	3.943A	3.916A	1.581A	639.667	90.762%	2021	43.5	41.86°C	0.999
	12.111V	5.072V	3.369V	5.059V	704.777				45.55°C	115.11V
5	62.007A	4.937A	4.907A	1.784A	799.857	90.411%	2053	44.4	42.07°C	0.999
	12.085V	5.064V	3.362V	5.047V	884.694				46.28°C	115.12V
6	74.649A	5.934A	5.900A	1.987A	959.928	89.814%	2090	44.7	42.64°C	0.999
	12.058V	5.056V	3.357V	5.034V	1068.797				47.86°C	115.12V
7	87.322A	6.934A	6.896A	2.191A	1119.684	89.005%	2121	44.9	43.18°C	0.999
	12.031V	5.049V	3.350V	5.021V	1258.002				49.44°C	115.12V
8	100.116A	7.937A	7.896A	2.397A	1280.206	87.979%	2170	45.4	43.80°C	0.999
	12.004V	5.041V	3.343V	5.009V	1455.120				51.94°C	115.12V
9	113.317A	8.444A	8.386A	2.401A	1439.578	86.778%	2239	45.6	44.35°C	0.999
	11.976V	5.033V	3.338V	4.999V	1658.928				54.03°C	115.14V
10	125.985A	8.956A	8.911A	4.038A	1599.856	85.361%	2307	46.5	45.25°C	0.999
	11.947V	5.025V	3.333V	4.955V	1874.232				55.66°C	115.15V
11	139.724A	8.968A	8.923A	4.045A	1759.943	83.818%	2393	47.8	46.67°C	0.999
	11.918V	5.018V	3.329V	4.946V	2099.720				58.05°C	115.14V
CL1	0.157A	17.001A	16.998A	0.000A	144.981	79.019%	2109	44.8	42.22°C	0.994
	12.170V	5.069V	3.347V	5.100V	183.476				46.60°C	115.15V

CL2	133.357A	1.003A	1.000A	1.000A	1608.243	85.593%	2306	46.5	45.56°C	0.999
	11.959V	5.035V	3.353V	5.024V	1878.947				55.65°C	115.14V

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	13.003A	1.965A	1.950A	0.982A	180.019	86.969%	1970	42.2	40.34°C	0.955
	12.183V	5.090V	3.384V	5.094V	206.991				42.41°C	230.31V
2	27.056A	2.952A	2.929A	1.181A	359.735	91.416%	1982	42.3	40.62°C	0.985
	12.154V	5.082V	3.378V	5.081V	393.516				43.20°C	230.33V
3	41.505A	3.449A	3.409A	1.381A	539.286	92.622%	2005	42.6	41.05°C	0.994
	12.126V	5.075V	3.372V	5.068V	582.244				44.20°C	230.33V
4	56.095A	3.947A	3.918A	1.583A	719.774	92.879%	2040	43.9	41.92°C	0.995
	12.097V	5.067V	3.367V	5.055V	774.959				45.13°C	230.33V
5	70.390A	4.942A	4.912A	1.786A	899.900	92.693%	2076	44.7	42.46°C	0.996
	12.067V	5.059V	3.359V	5.041V	970.844				46.40°C	230.33V
6	84.748A	5.940A	5.905A	1.990A	1079.993	92.331%	2111	44.8	42.72°C	0.997
	12.038V	5.050V	3.352V	5.028V	1169.694				46.86°C	230.33V
7	99.174A	6.944A	6.905A	2.195A	1259.790	91.793%	2182	45.5	43.31°C	0.998
	12.006V	5.041V	3.345V	5.013V	1372.428				48.99°C	230.33V
8	113.730A	7.949A	7.910A	2.401A	1440.330	91.117%	2249	46.0	43.81°C	0.998
	11.975V	5.033V	3.338V	4.999V	1580.741				50.77°C	230.33V
9	128.685A	8.460A	8.401A	2.406A	1619.658	90.413%	2321	46.7	44.93°C	0.998
	11.945V	5.025V	3.333V	4.989V	1791.409				52.96°C	230.33V
10	143.173A	8.975A	8.928A	4.047A	1799.899	89.498%	2406	47.9	45.69°C	0.998
	11.910V	5.015V	3.326V	4.943V	2011.114				54.91°C	230.33V
11	151.780A	8.980A	8.935A	4.051A	1899.831	89.144%	2384	47.8	46.84°C	0.998
	11.893V	5.012V	3.324V	4.938V	2131.195				57.11°C	230.33V
CL1	0.152A	17.000A	17.001A	0.000A	144.908	80.289%	2113	44.8	42.22°C	0.946
	12.169V	5.069V	3.346V	5.100V	180.482				46.22°C	230.34V

CL2	150.020A	1.003A	0.999A	1.000A	1802.390	89.788%	2380	47.7	45.53°C	0.998
	11.925V	5.028V	3.349V	5.014V	2007.393				54.57°C	230.33V

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	1.186A	0.489A	0.470A	0.195A	19.565	45.347%	1945	42.0	0.935
	12.210V	5.097V	3.391V	5.118V	43.145				115.12V
2	2.425A	0.980A	0.971A	0.391A	39.887	61.926%	1939	42.0	0.961
	12.207V	5.097V	3.389V	5.113V	64.411				115.11V
3	3.598A	1.472A	1.445A	0.587A	59.306	70.587%	1942	42.0	0.976
	12.204V	5.096V	3.388V	5.108V	84.018				115.11V
4	4.847A	1.963A	1.947A	0.784A	79.727	75.434%	1953	42.1	0.979
	12.200V	5.094V	3.386V	5.103V	105.691				115.11V

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	1.179A	0.489A	0.469A	0.196A	19.482	45.458%	1941	42.0	0.662
	12.210V	5.097V	3.391V	5.118V	42.857				230.29V
2	2.425A	0.980A	0.970A	0.391A	39.879	62.857%	1944	42.0	0.768
	12.206V	5.096V	3.389V	5.112V	63.444				230.29V
3	3.601A	1.472A	1.443A	0.588A	59.333	71.309%	1952	42.1	0.836
	12.203V	5.095V	3.387V	5.107V	83.205				230.30V
4	4.852A	1.962A	1.947A	0.784A	79.776	76.484%	1961	42.1	0.879
	12.199V	5.094V	3.386V	5.102V	104.304				230.31V

The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	12.1 mV	7.9 mV	12.1 mV	14.0 mV	Pass
20% Load	12.3 mV	9.8 mV	11.8 mV	16.0 mV	Pass
30% Load	13.0 mV	10.8 mV	12.3 mV	17.5 mV	Pass
40% Load	13.8 mV	12.3 mV	13.4 mV	17.8 mV	Pass
50% Load	14.5 mV	14.4 mV	14.2 mV	19.3 mV	Pass
60% Load	16.0 mV	15.7 mV	14.6 mV	20.4 mV	Pass
70% Load	15.9 mV	17.0 mV	15.1 mV	22.5 mV	Pass
80% Load	16.9 mV	18.9 mV	18.3 mV	25.1 mV	Pass
90% Load	30.6 mV	30.2 mV	43.8 mV	39.8 mV	Pass
100% Load	30.7 mV	30.5 mV	41.4 mV	43.3 mV	Pass
110% Load	31.6 mV	32.4 mV	42.9 mV	47.0 mV	Pass
Crossload 1	14.1 mV	19.5 mV	23.3 mV	13.5 mV	Pass
Crossload 2	27.9 mV	26.2 mV	35.9 mV	36.4 mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	12.1 mV	7.6 mV	11.8 mV	13.6 mV	Pass
20% Load	12.7 mV	9.7 mV	11.5 mV	15.4 mV	Pass
30% Load	13.2 mV	11.5 mV	13.3 mV	17.0 mV	Pass
40% Load	13.8 mV	13.0 mV	13.6 mV	17.3 mV	Pass
50% Load	15.0 mV	14.8 mV	13.9 mV	19.1 mV	Pass
60% Load	15.5 mV	16.2 mV	15.0 mV	20.5 mV	Pass
70% Load	16.5 mV	17.9 mV	15.6 mV	22.8 mV	Pass
80% Load	17.7 mV	19.6 mV	18.0 mV	25.6 mV	Pass

Test	12V	5V	3.3V	5VSB	Pass/Fail
90% Load	18.4 mV	20.5 mV	18.8 mV	27.1 mV	Pass
100% Load	19.7 mV	22.1 mV	20.1 mV	34.1 mV	Pass
110% Load	21.1 mV	22.8 mV	21.0 mV	35.3 mV	Pass
Crossload 1	14.8 mV	13.9 mV	23.5 mV	12.0 mV	Pass
Crossload 2	19.9 mV	18.3 mV	16.5 mV	30.2 mV	Pass

The results above are not used in the certification process

Enermax MaxRevo 1800W



Top side



Power specifications label

Cybenetics □□□□□□□□□□□□□□□□□□ ETA□□□□□ LAMBDA□□□□□ SAFE□□□□□□□□□□□□□□□□□ DELTA□□□□□□□ PHI□□□□□□□□□