



## Industrial Grade AC/DC Power Supply With PFC

|                             |                                          |                            |                           |                             |
|-----------------------------|------------------------------------------|----------------------------|---------------------------|-----------------------------|
| 85-264Vrms<br>Input Voltage | 12/15/24/28/48V<br>Semi-Regulated Output | 1100W<br>Output Continuous | 1300W<br>Output Transient | 93%<br>Full Load Efficiency |
|-----------------------------|------------------------------------------|----------------------------|---------------------------|-----------------------------|



*ACuQor*®

### Product Features

- High efficiency (93% for 48 VOUT Model at 1100W)
- Universal input voltage range
- Semi-regulated output for bus stability
- Integral fan cooling with speed control
- Active PFC; EN61000-3-2 compliant
- Low noise; EN55011 / EN55022 Class B compliant
- Over-current, over-voltage, & over-temp protection
- DC Power Good / AC Power Good signals
- Fan status output / Remote enable input
- Small size: 4.75" x 7" x 1.625" (encased)
- RoHS 6/6 compliant
- 5 V (500 mW) standby output



**AC Input:** 85-264Vrms  
**DC Output:** 12/15/24/28/48V  
**Power:** 1100W  
**Grade:** Industrial

# ACuQor 1 100W Series Electrical Characteristics

All specifications typical with TA = 25 °C, unless otherwise specified.

| MAIN OUTPUT SPECIFICATIONS                                 |                                 |                       | GENERAL SPECIFICATIONS        |                                   |                          |                                                          |
|------------------------------------------------------------|---------------------------------|-----------------------|-------------------------------|-----------------------------------|--------------------------|----------------------------------------------------------|
| Output power (continuous)<br>(5 s transient)               | 85-132/170-264 Vrms             | 1100W                 | Fundamental ripple freq.      | Input                             | 500 kHz                  |                                                          |
|                                                            | 85-132/170-264 Vrms             | 1300W                 |                               | Output                            | 250 kHz                  |                                                          |
| Nominal DC output<br>voltage (at 800W)<br>(Semi-regulated) | 132-170 Vrms                    | See Figure 12         | Audible noise<br>Weight       | Fan speed varies with temp.       |                          | 45 dBA @ 1 m max.                                        |
|                                                            | 12 Vout                         | 12.4 V                |                               | ( AQ0800xxxxGC )                  |                          | 998 g (35.2 oz)                                          |
|                                                            | 15 Vout                         | 15.6 V                |                               | ( AQ1100xxxxGC )                  |                          | 1179 g (41.6 oz)                                         |
|                                                            | 24 Vout                         | 25 V                  |                               | ( AQ1400xxxxGC )                  |                          | 1179 g (41.6 oz)                                         |
|                                                            | 28 Vout                         | 29 V                  | MTBF                          | MIL-217                           | 533 kHours               |                                                          |
| 48 Vout                                                    | 50 V                            | Demonstrated          |                               | TBD kHours                        |                          |                                                          |
| ISOLATION SPECIFICATIONS                                   |                                 |                       |                               |                                   |                          |                                                          |
| Efficiency (see figs. 1 - 10)                              | 12 Vout, 115 Vrms, 1100W        | 89% typ.              | Isolation voltage             | Input to output                   | 3000 Vrms                |                                                          |
|                                                            | 24 Vout, 115 Vrms, 1100W        | 90% typ.              |                               | Input to ground                   | 1500 Vrms                |                                                          |
|                                                            | 48 Vout, 115 Vrms, 1100W        | 91% typ.              |                               | Output to ground                  | 500 Vrms                 |                                                          |
|                                                            | 12 Vout, 230 Vrms, 1100W        | 90.5% typ.            |                               |                                   |                          |                                                          |
|                                                            | 24 Vout, 230 Vrms, 1100W        | 91.5% typ.            |                               |                                   |                          |                                                          |
| 48 Vout, 230 Vrms, 1100W                                   | 92.5% typ.                      |                       |                               |                                   |                          |                                                          |
| Hold-up time (to -20%)                                     | 12 / 15 Vout                    | 16 ms @ 1100W         | Insulation resistance         | Output to ground                  | 10 MΩ min.               |                                                          |
|                                                            | 24 / 28 / 48 Vout               | 20 ms @ 1100W         | Leakage currents              |                                   | See Note 2               |                                                          |
| Maximum load capacitance                                   | 12 Vout                         | 48,000 µF             | ENVIRONMENTAL CHARACTERISTICS |                                   |                          |                                                          |
|                                                            | 15 Vout                         | 40,500 µF             | Thermal performance           | Operating ambient (see Figure 11) |                          | 0 °C to +70 °C                                           |
|                                                            | 24 Vout                         | 24,000 µF             |                               | Non-operating ambient             |                          | -40 °C to +85 °C                                         |
|                                                            | 28 Vout                         | 19,200 µF             | Relative humidity             | Non-condensing                    |                          | 5-95% RH                                                 |
|                                                            | 48 Vout                         | 6,000 µF              |                               | Altitude                          |                          | Operating 10,000 ft max.<br>Non-operating 30,000 ft max. |
| Output ripple voltage                                      | Switching frequency (20 MHz BW) | 0.5% p-p              | Random vibration              | 5-500 Hz                          |                          | 0.03 g2/Hz                                               |
|                                                            | Twice line frequency (at 800W)  | 5.0% p-p              |                               | Shock                             | Half-sine, 10 ms, 3 axes |                                                          |
| Turn-on delay                                              |                                 | 2 s max.              | EMC CHARACTERISTICS           |                                   |                          |                                                          |
| Transient response                                         | Iout steps from 50-75%          | 3% typ / 6% max. dev. | Conducted emissions           | EN55011 and EN55022, FCC          |                          | Level B                                                  |
|                                                            | At 0.2 A/µs                     | 100 ms recovery       |                               | part15                            |                          |                                                          |
| Overvoltage protection                                     | Cyclic restart                  | 110-120%              | Line frequency harmonics      | EN61000-3-2                       |                          | Class A                                                  |
| Short circuit protection                                   | Cyclic operation                | 115% rated Iout       |                               | Voltage fluctuations              |                          | EN61000-3-3                                              |
| Total regulation                                           | Over line, load and temperature | ±6.0%                 | ESD air                       | EN61000-4-2                       |                          | Level 3                                                  |
| Auxiliary Output                                           | Always on (See Note 1)          | 5 V @ 100 mA          | ESD contact                   | EN61000-4-2                       |                          | Level 3                                                  |
| Thermal protection                                         | Automatic recovery              | +125 °C (PCB Temp)    | Radiated immunity             | EN61000-4-3                       |                          | Level 3                                                  |
| REMOTE_ENABLE                                              | Input Low Voltage               | 0.45 V (max)          |                               | Fast transients                   |                          | EN61000-4-4                                              |
|                                                            | Input High Voltage              | 4.15 V (min)          | Line surge immunity           |                                   | EN61000-4-5              | Level 3                                                  |
| INPUT SPECIFICATIONS                                       |                                 |                       | Conducted immunity            | EN61000-4-6                       |                          | Level 3                                                  |
| AC input voltage                                           | Universal range                 | 85-264 Vrms           |                               | Power freq. mag. field            | EN61000-4-8              |                                                          |
| Input frequency                                            |                                 | 47-63 Hz              | Voltage dip immunity          |                                   | EN61000-4-11             |                                                          |
| Input current                                              | 115 Vrms @ 1100W                | 11 Arms               |                               |                                   |                          | <5% UT 10 ms,                                            |
|                                                            | 230 Vrms @ 1100W                | 5.5 Arms              |                               |                                   | 70% UT 500 ms,           |                                                          |
| Power factor                                               |                                 | >0.98                 |                               |                                   | 40% UT 100 ms            |                                                          |
| Input surge current                                        | 264 Vrms (cold start)           | 50 A max.             |                               |                                   |                          |                                                          |
| Internal input fuses                                       | Both AC lines                   | 20 A                  |                               |                                   |                          |                                                          |

## NOTES:

- Derate 2 mA per °C above 50 °C ambient temperature.
- Leakage currents see page 4.

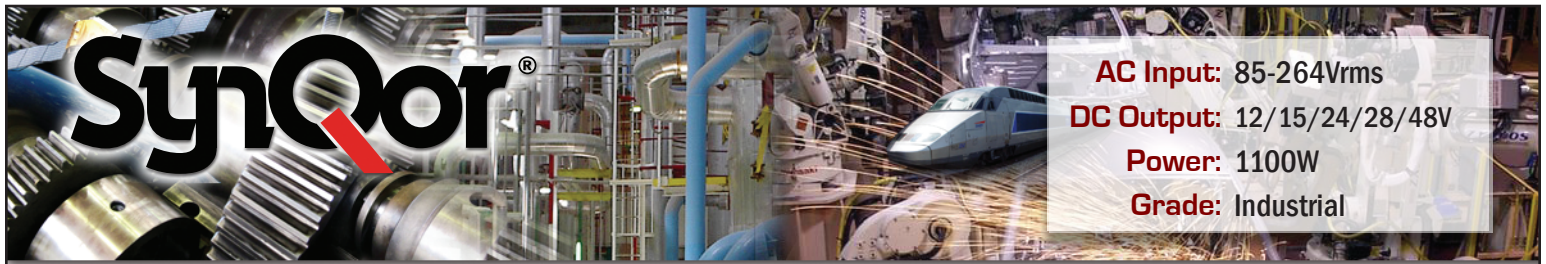
## SAFETY AGENCY CERTIFICATIONS

EN 60950-1:2006/A11:2009/A1:2010

UL60950-1:2007

CAN/CSA-22.2 No. 60950-1:2007

CE Marked



## EFFICIENCY, DERATING, AND $V_{out}$ DROOP CURVES

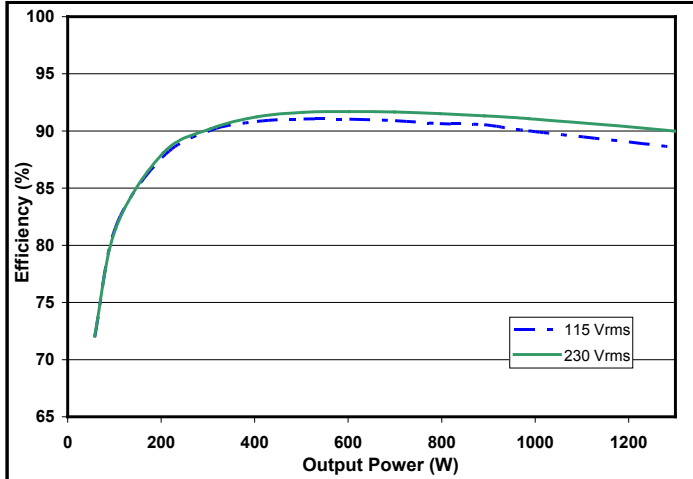


Figure 1: 12 VOUT efficiency curves.

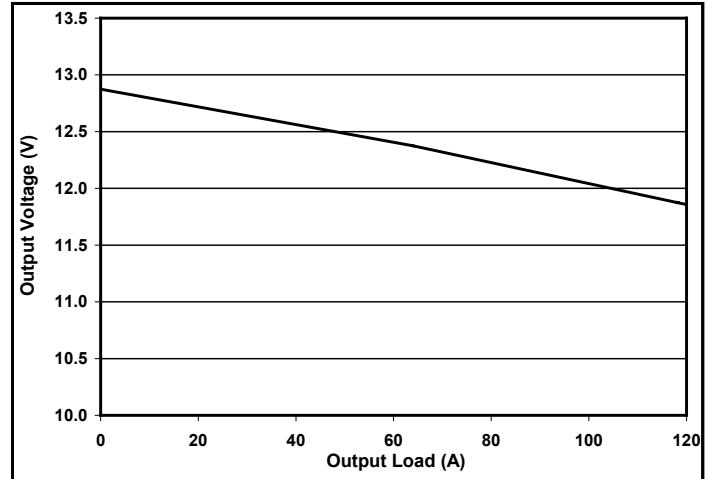


Figure 2: 12 VOUT droop characteristic.

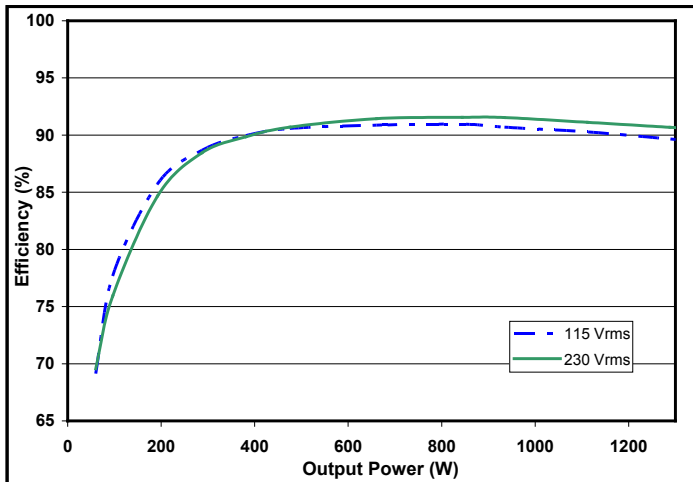


Figure 3: 15 VOUT efficiency curves.

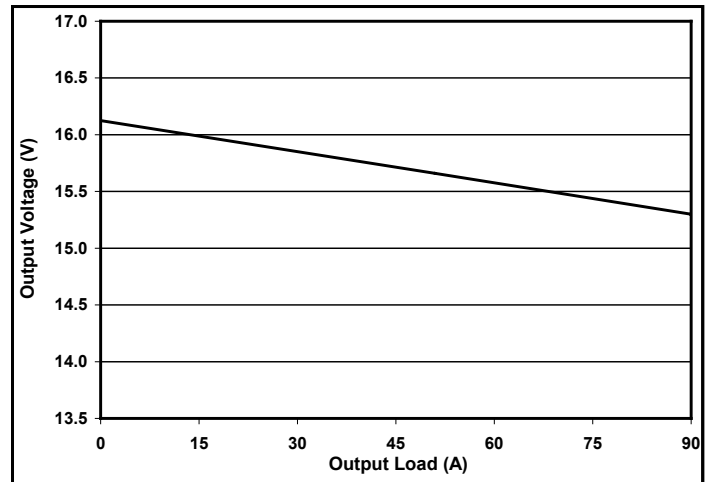


Figure 4: 15 VOUT droop characteristic.

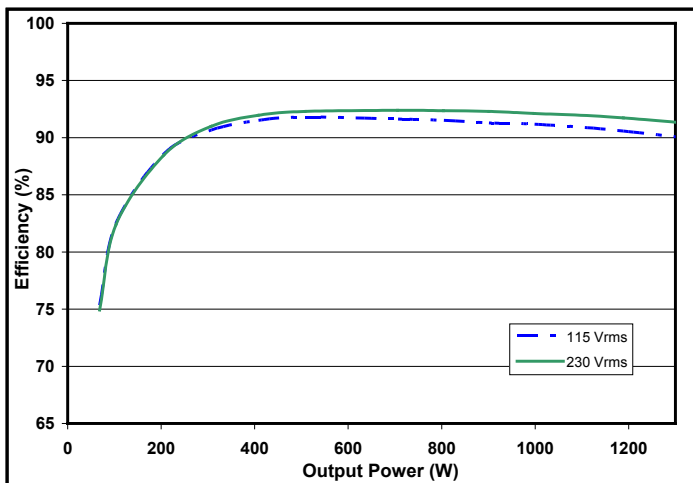


Figure 5: 24 VOUT efficiency curves.

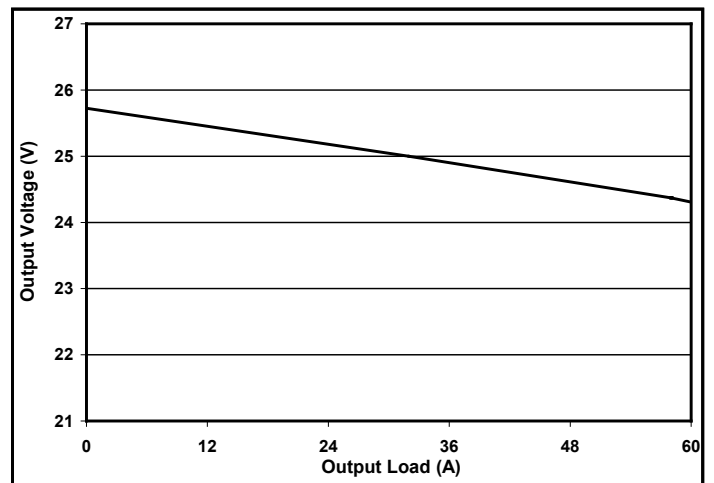


Figure 6: 24 VOUT droop characteristic.

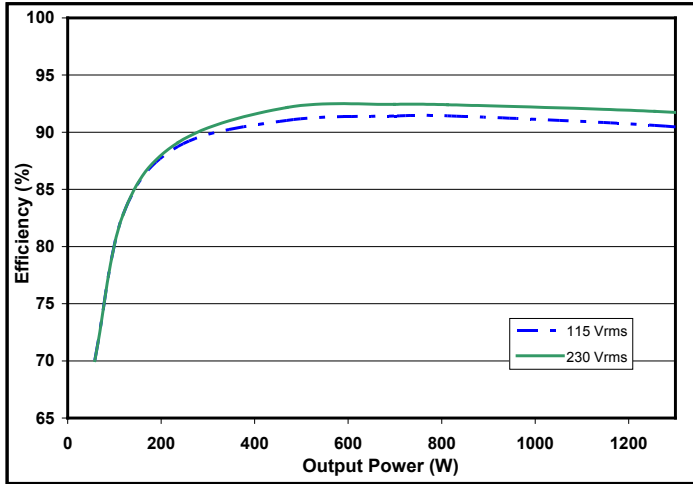
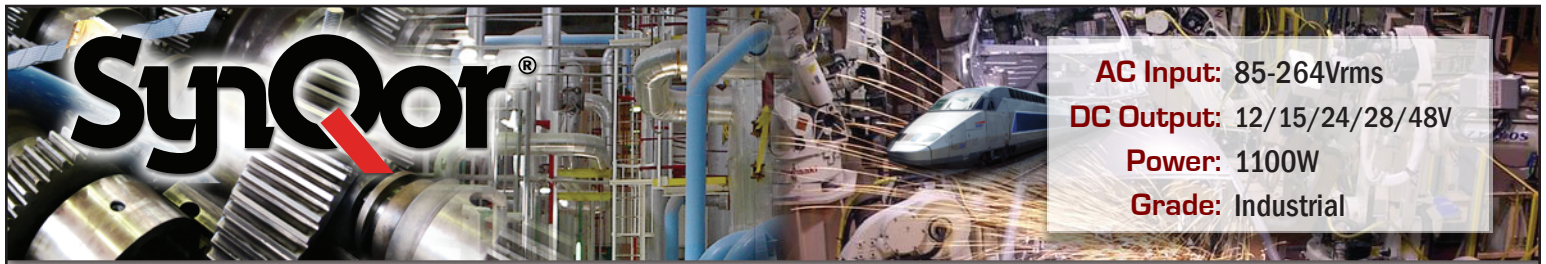


Figure 7: 28 VOUT efficiency curves.

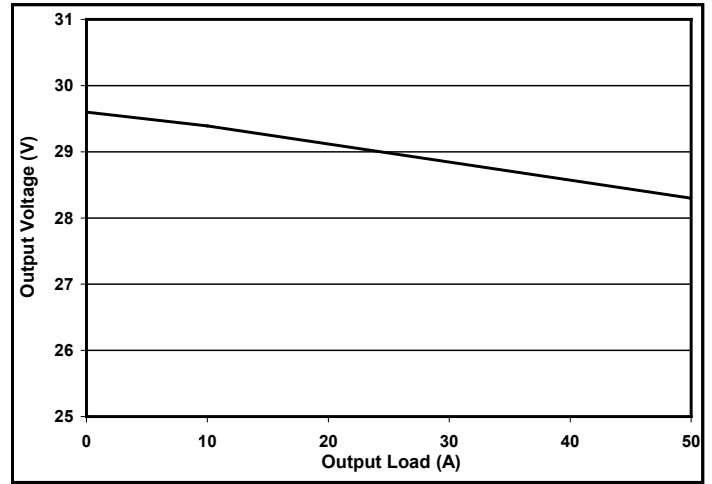


Figure 8: 28 VOUT droop characteristics.

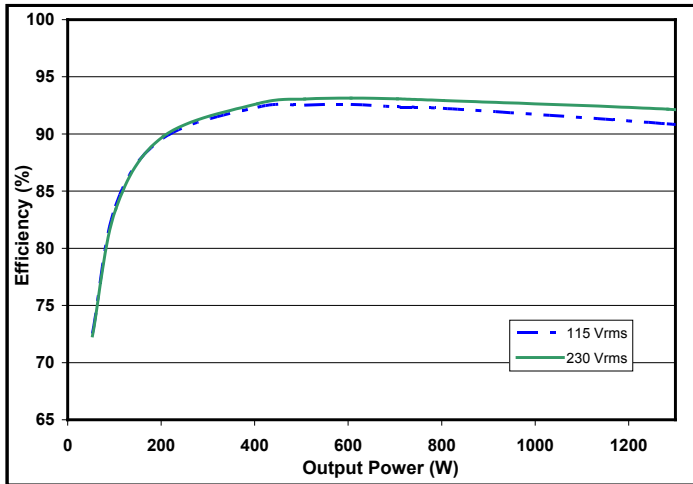


Figure 9: 48 VOUT efficiency curves.

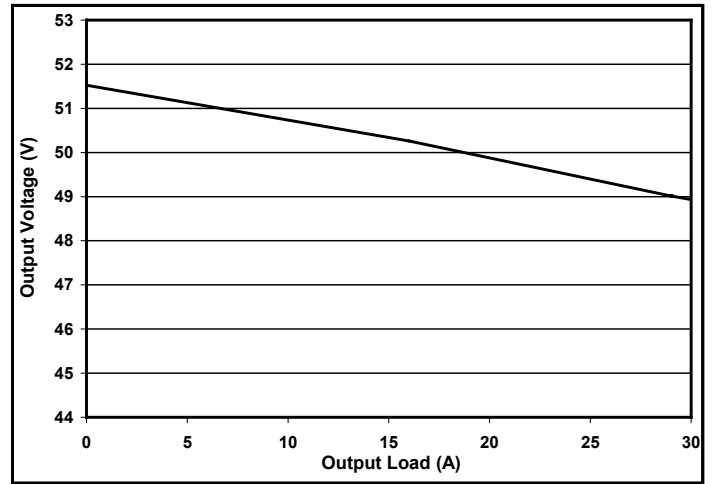


Figure 10: 48 VOUT droop characteristics.

| AC Leakage Current from Input to Earth             | AC Line Connection                  | Normal Condition | Open Neutral Fault |
|----------------------------------------------------|-------------------------------------|------------------|--------------------|
| ACuQor Typical at 110% nominal input voltage 60 Hz | 240 V L-N, 1 phase                  | 400 $\mu$ A      | 800 $\mu$ A        |
|                                                    | 208 V L-L, 120 V L-N, 1 of 3 phases | 200 $\mu$ A      | 400 $\mu$ A        |
|                                                    | 240 V L-N-L, 120 V L-N, split phase | 200 $\mu$ A      | 400 $\mu$ A        |

Table 1: Leakage Currents

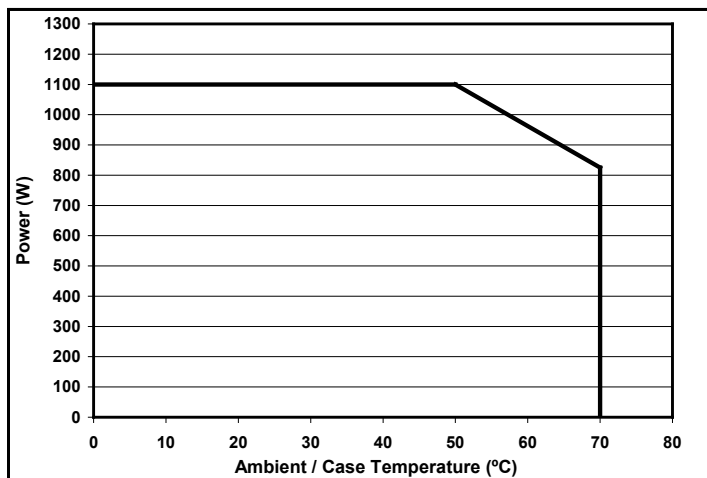


Figure 11: Continuous power derating curve in natural convection.

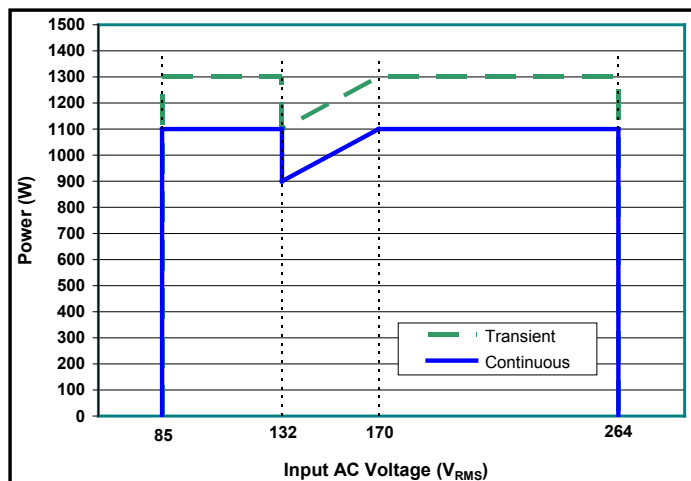
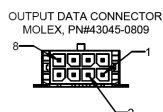
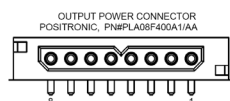


Figure 12: Rated output power vs Input AC Voltage.



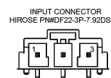
#### OUTPUT DATA CONNECTOR PINOUT

|       |               |                                                                                                                                         |
|-------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Pin 1 | Reserved      | Reserved for future use.                                                                                                                |
| Pin 2 | Reserved      | Reserved for future use.                                                                                                                |
| Pin 3 | VOUT(-)       | Negative Output Voltage                                                                                                                 |
| Pin 4 | REMOTE_ENABLE | Logic input. See Figure B. Pull high to enable main output.                                                                             |
| Pin 5 | FAN_GOOD      | Open collector with internal 5 V pullup. See Figure A. Pulsed low on fan failure, 100 ms, 50% duty.                                     |
| Pin 6 | AC_POWER_GOOD | Open collector with internal 5 V pullup. See Figure A. Pulled low on AC power dropout.                                                  |
| Pin 7 | DC_POWER_GOOD | Open collector with internal 5 V pullup. See Figure A. Pulled low during startup ramp and within 5°C of temperature shutdown threshold. |
| Pin 8 | 5V_STANDBY    | 5 V @ 100 mA available whenever AC power is applied.                                                                                    |



#### OUTPUT POWER CONNECTOR PINOUT

|       |         |                         |
|-------|---------|-------------------------|
| Pin 1 | VOUT(+) | Positive Output Voltage |
| Pin 2 | VOUT(-) | Negative Output Voltage |
| Pin 3 | VOUT(+) | Positive Output Voltage |
| Pin 4 | VOUT(-) | Negative Output Voltage |
| Pin 5 | VOUT(+) | Positive Output Voltage |
| Pin 6 | VOUT(-) | Negative Output Voltage |
| Pin 7 | VOUT(+) | Positive Output Voltage |
| Pin 8 | VOUT(-) | Negative Output Voltage |



#### INPUT CONNECTOR PINOUT

|       |            |
|-------|------------|
| Pin 1 | Ground     |
| Pin 2 | AC Neutral |
| Pin 3 | AC Line    |

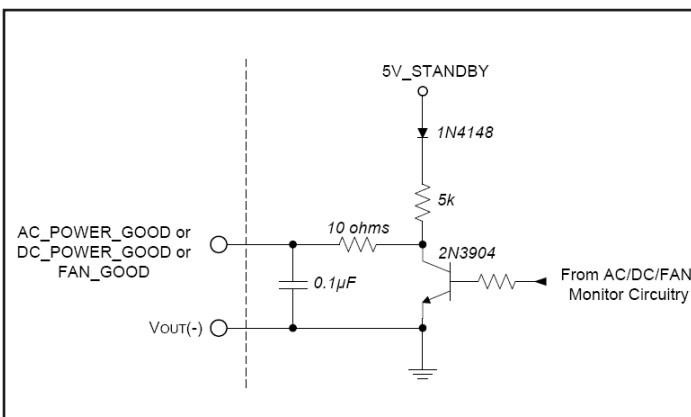


Figure A: Power good and fan good interface circuitry.

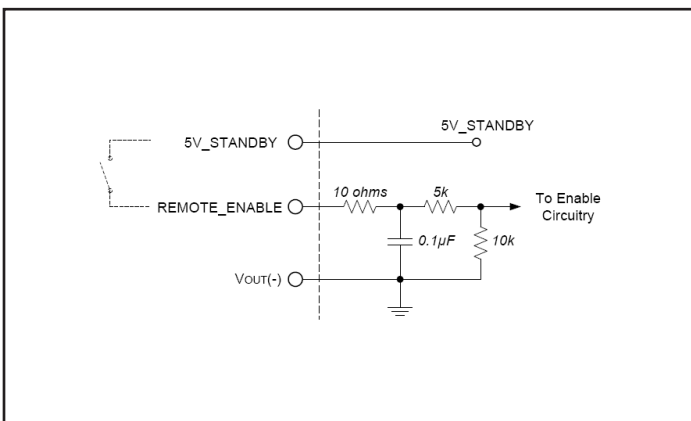
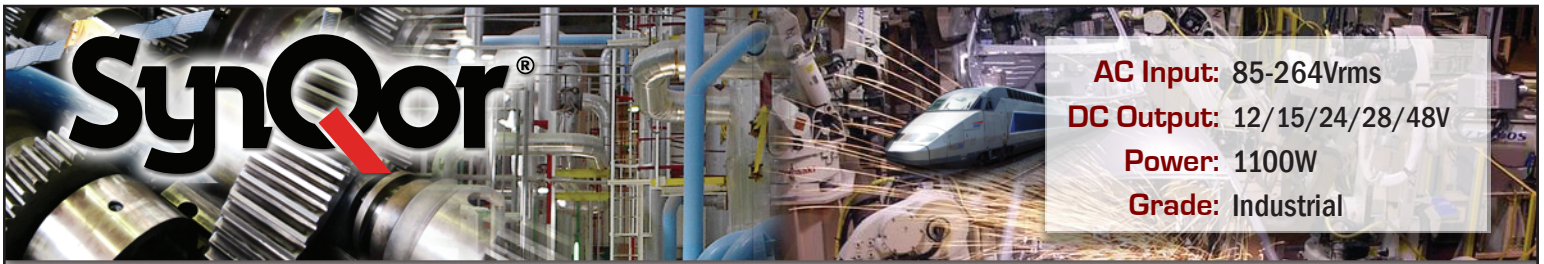


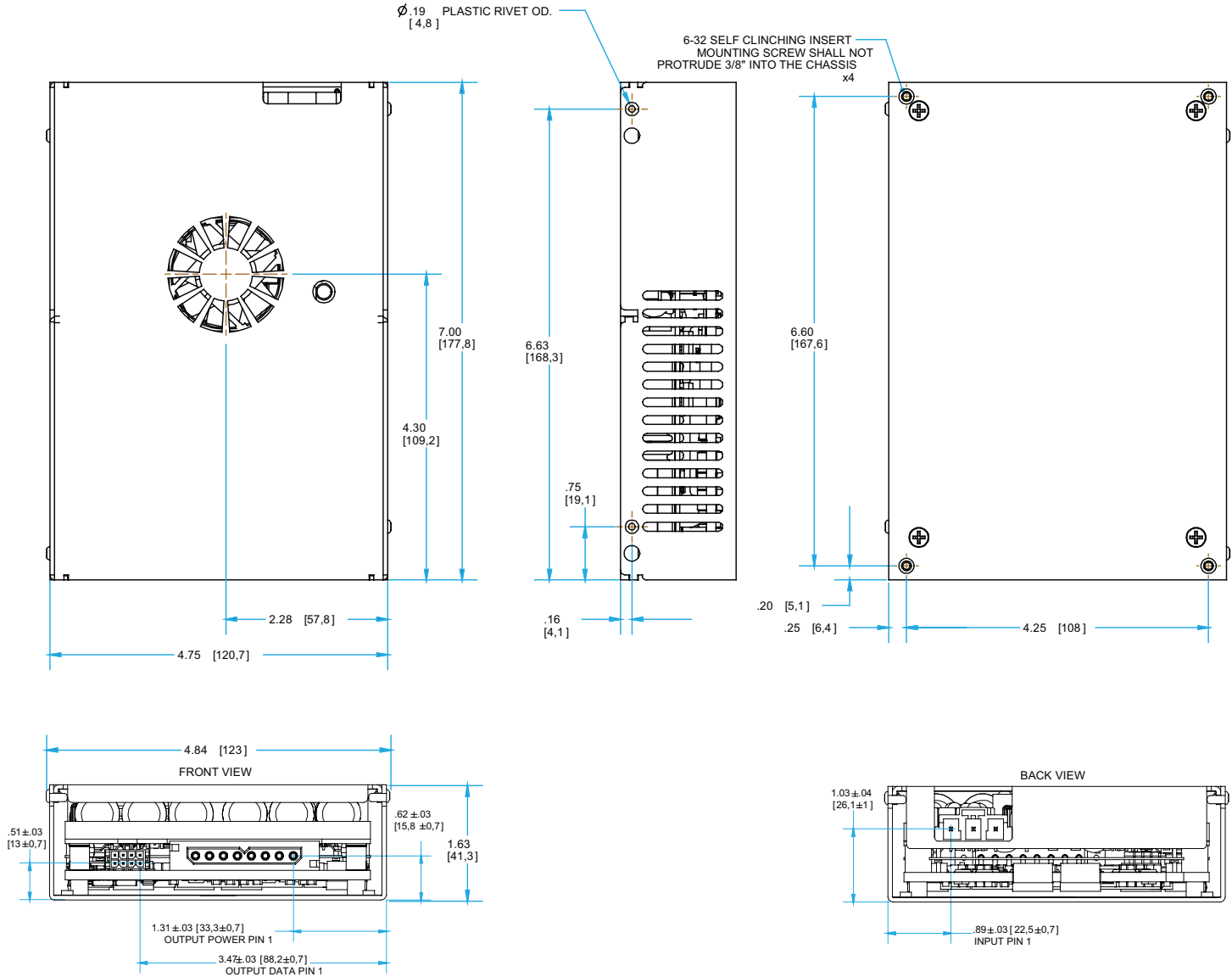
Figure B: Remote enable interface circuitry.

#### MATING CONNECTORS

| Connector      | Type                  | Contact             |
|----------------|-----------------------|---------------------|
| OUTPUT (Power) | Positronic PLA08M7    | Positronic MS112N   |
| OUTPUT (Data)  | Molex 43025-0800      | Molex 43030-0008    |
| INPUT          | Hirose DF22B-3S-7.92C | Hirose DF22A-1012SC |



## MECHANICAL DRAWINGS



## NOTES

1. Recommended screw tightening torque of 6in.. lbs.
2. Undimensioned components are shown for visual reference only
3. All dimensions in inches [mm]  
Tolerances: x.xx in  $\pm$  0.02  
x.xxx in  $\pm$  0.010



## INSTALLATION INSTRUCTIONS

**GENERAL INFORMATION:** ACuQor AC/DC power supplies are intended for use as components in medical and industrial equipment. ACuQor units must be properly installed within end use equipment before they can be safely applied as described in this document. The suitability of the ACuQor/equipment combination must be verified through end product investigation.

**MOUNTING:** Refer to the Mechanical Drawings section. ACuQor units are provided with threaded stainless-steel stand-offs or inserts for mounting. This mounting hardware is internally connected to the input connector protective-earth terminal for functional-earth EMC control. Any orientation (vertical, horizontal, etc.) may be used. Adequate air space should be provided over the fan intake (top) and exhaust (sides) to allow for exchange of cooling air. ACuQor is designed for a pollution degree 2 environment. A minimum of 5 mm electrical clearance should be allowed from the connector ends of encased models.

**INPUT:** Refer to the Connector Details section for input connector wiring. ACuQor products require a single phase AC power source of 100-240V 50/60Hz nominal. Refer to nameplate label for input current ratings. A protective-earth connection is also required. Minimum wire size of 14 AWG (2.5mm<sup>2</sup>) is recommended. Both sides of the AC line are internally fused (see table for specific models). These fuses are not user replaceable.

**OUTPUT:** Refer to the Connector Details section for the output connector wiring and signal I/O functionality. Refer to nameplate label for output current ratings. Main DC output (Vout+, Vout-) pins should use 12 AWG (4.0mm<sup>2</sup>) wire size. Individual main output pins should not be loaded to more than 30 A. For currents greater than 30 A, multiple main output pins/wires must be used in parallel. All signal I/O pins are referenced to Vout-.

**EMC:** ACuQor products have been tested to the EMC specifications listed in the section of the datasheet titled Electrical Characteristics, on page two. However, end use equipment must be tested to verify EMC compliance.

**HIPOT TESTING:** ACuQor products are rated for Hipot testing levels of 1500 Vac input to protective-earth, 500 Vac output to protective-earth, and 3000 Vac input to output. When performing the 3000 Vac input to output test, the test voltage must be balanced evenly 1500 Vac input and output to protective-earth. Two oppositely phased test voltage sources or a single test voltage source with external balancing impedances (capacitors) may be used to prevent overstressing input or output to protective-earth insulation per IEC/EN 60950-1.

| MODEL  | Input Fuses<br>(in Both AC Lines) | Fuses<br>Total |
|--------|-----------------------------------|----------------|
| AQ0800 | Cooper Bussmann 20A 250V GBB-20   | 2              |
| AQ1100 | Cooper Bussmann 20A 250V GBB-20   | 2              |
| AQ1400 | Cooper Bussmann 20A 250V GBB-20   | 2              |

Table 2: AC line fuse for specific ACuQor Industrial Models



## PART NUMBERING SYSTEM

The part numbering system for SynQor's ACuQor AC/DC power supplies follows the format shown in the table below. Not all combinations make valid part numbers, please contact SynQor for availability.

| Family                                                                    | Output Power                                                  | Grade                                         | Range                             | Output Voltage                                                                         | Package Type             | Thermal Design    | Options                                                                                                                                                                                                             |
|---------------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------|--------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AQ:</b><br>ACuQor series of AC-DC semi-regulated output power supplies | <b>0800:</b> 800W<br><b>1100:</b> 1100W<br><b>1400:</b> 1400W | <b>M:</b> (Medical)<br><b>I:</b> (Industrial) | <b>U:</b> Universal (85-264 VRMS) | <b>12:</b> 12V<br><b>15:</b> 15V<br><b>24:</b> 24V<br><b>28:</b> 28V<br><b>48:</b> 48V | <b>G:</b> 1 unit (5"x7") | <b>C:</b> Encased | <b>Medical Grade</b><br><b>B:</b> B isolation rating<br><b>BF:</b> BF isolation rating<br><b>CF:</b> CF isolation rating<br><b>CFD:</b> CF isolation rating defibrillator proof<br><br><b>IND:</b> Industrial Grade |

Example: **AQ1100IU24GCIND**

## ACCESSORIES

SynQor offers a series of assemblies that can be ordered according to the table below. Mechanical drawings for these accessories are available for download in pdf format from the SynQor website.

| Part Number            | Description                                                                    |
|------------------------|--------------------------------------------------------------------------------|
| <b>AQ-CBL-INPUT1CG</b> | Input mating cable with pre-stripped wire ends (36" long)                      |
| <b>AQ-CBL-OUT1CDG</b>  | Output mating cables (Signal and Power) with pre-stripped wire ends (18" long) |

## APPLICATION NOTES

A variety of application notes and technical white papers can be downloaded in pdf format from the SynQor website.

[Online Application Notes](#)

[Online Library of Technical White Papers](#)

[SynQor website.](#)

## PATENTS

SynQor holds the following U.S. patents, one or more of which apply to each product listed in this document. Additional patent applications may be pending or filed in the future.

|           |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|-----------|
| 5,999,417 | 6,222,742 | 6,545,890 | 6,577,109 | 6,594,159 | 6,731,520 |
| 6,894,468 | 6,896,526 | 6,927,987 | 7,050,309 | 7,072,190 | 7,085,146 |
| 7,119,524 | 7,269,034 | 7,272,021 | 7,272,023 | 7,558,083 | 7,564,702 |
| 7,765,687 | 7,787,261 | 8,023,290 | 8,149,597 |           |           |

### Warranty

SynQor offers a three (3) year limited warranty. Complete warranty information is listed on our website or is available upon request from SynQor.

Information furnished by SynQor is believed to be accurate and reliable. However, no responsibility is assumed by SynQor for its use, nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of SynQor.

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