POWER SUPPLY
Product Specification – HF12-S-M-Q-Q-203

Document No. HITEKPSCHF12-01342.DOC

DRAFT

TABLE OF CONTENTS WILL BE UPDATED ONCE SPEC IS COMPLETE!!!!

Table Of Contents

1 Scope

This specification is for a 50/60 Hz, 100-240V wide range input power factor corrected multiple output modular type power supply capable of delivering 1200W of continuous DC output power with fully loaded DC-DC converter bays.

2 General

The CHF12 power supply series will incorporate one (1) cooling fan in an enclosed aluminum chassis with the output end open.

3 Electrical Requirements

Specifications apply under all combinations of rated input voltage, output current, total power, and operating environmental conditions unless otherwise specified or noted. Output voltage shall be measured at the point of connection of the remote sense.

3.1 N/A

3.2 Input

3.2.1 Input Voltage Range

The power supply AC RMS operating voltage range shall be per the following chart:

Minimum	100 Vac	
Nominals	120 Vac	230 Vac
Maximum	240 Vac	

Unit shall operate within all specified parameters over the entire range of minimum to maximum input line. All voltages are for single phase, two wire plus ground, sinusoidal voltage. Nominal values are specified for the purpose of defining operating characteristics.
(Note: the range listed is the UL label rating of the supply, the tested range is 90 – 264VAC)

3.2.2 Input Voltage Range Select - NA

3.2.3 Power Factor

The power factor shall meet the requirements of EN60555-2.
See sect 3.2.5.1 for input current harmonics.

3.2.4 Input Frequency

The power supply shall operate over the following line frequency range:

min	47 Hz
max	63 Hz

3.2.5 Input Current

The maximum continuous input RMS current shall be less than the values shown in the following table. The following table is based on a maximum output power of 1200W, 0.98 power factor , and efficiency of 80% :

	CHF12
Vac	**I line max**
100 Vac	15.0 Arms
240 Vac	6.3 Arms

3.2.5.1 Input Current Harmonics

The power supply shall meet the following harmonic requirements of EN60555-2 at 230 Vac at any load greater than 75W up to 1200W.

EN60555-2

Harmonic Order	Max Permissible Harmonic Current (A)
Odd Harmonics:	
3	2.3
5	1.14
7	0.77
9	0.4
11	0.33
13	0.21
15≤n≤39	0.15·15/n
Even Harmonics:	
2	1.08
4	0.43
6	0.3
8≤n≤40	0.23·8/n

IEC1000-3-2 or EN61000-3-2

Harmonic Order n	Max permissible harmonic current	
	relative limits mA/W	absolute limits A
Odd harmonics		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13≤n≤39 (odd harmonics only)	3.85/n	See EN60555-2 limits to left

This product meets the criteria for Class D equipment as outlined in the above specifications and therefore is required to meet the lower harmonic limits.

3.2.6 Inrush Current

The peak AC cold-start inrush current must not exceed 70A under any combination of line voltage, line frequency, or turn-on timing relative to the applied line voltage waveform.

3.2.7 Input Fusing

The power supply shall have an internal, replaceable fuse (fast blow) of sufficient rating to survive repetitive cycling of the AC line. The fuse shall protect the unit against fire hazards associated with abnormal failures of internal components.

3.2.8 Start and Stop Voltages

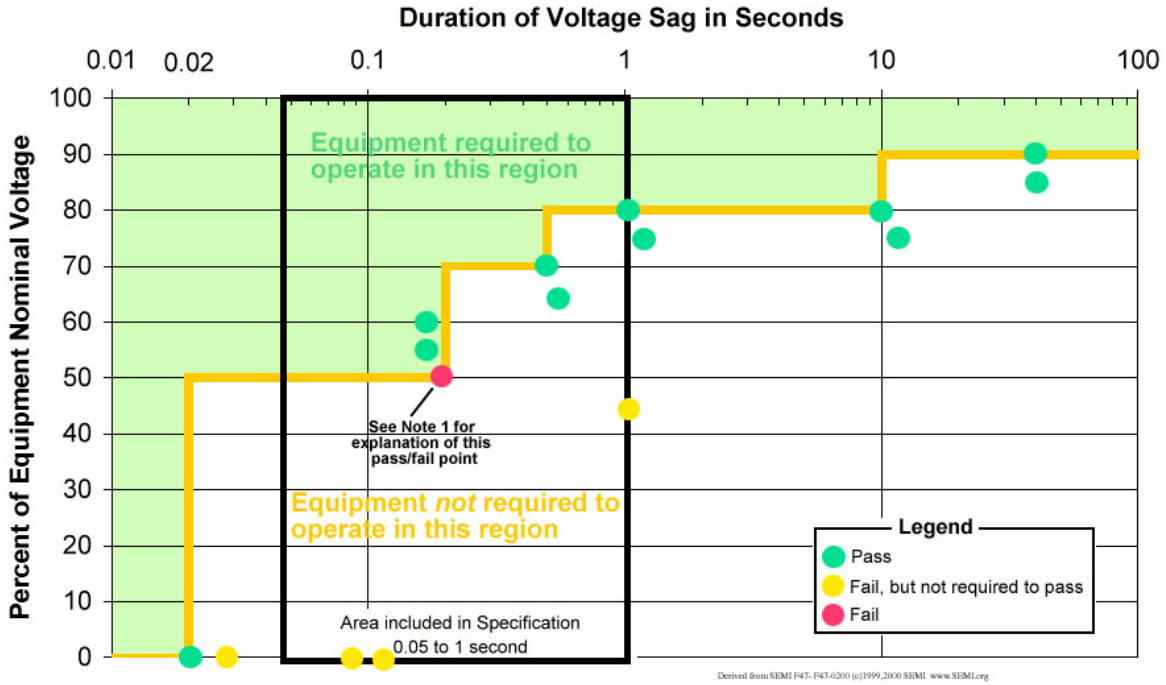
Not applicable.

3.2.9 Operation Outside Specified Range

The power supply shall not be damaged by sustained operation at voltages below the minimum input voltage.

3.2.9.1 Semi F47 Voltage Sag Immunity

The power supply shall withstand the voltage sag requirements of Semi F47 as defined below without damage or interuption.



Voltage Sag Immunity - SEMI F47

Intratech Stepper/Washer, 240V 50 Hz power

Model 2200, S/N 99SW4502, 5/00

3.3 Output

3.3.1 Total Power Output

The power supply shall be capable of providing a maximum of 1200W output power under the specified ranges of line and over the rated temperature range.
NOTE: Initial prototype units are rated for 1000W

3.3.2 Output Voltages and Currents

Model	Nominal Output	Output Current Min.	Output Current Max.	Output Power Max (1)	Max Power @115VAC	Max Power @230VAC
HF12-S-M-Q-Q-203					**875W**	**1200W**
OUTPUT 1	24V	0A	9A	216W		
OUTPUT 2	24V	0A	9A	216W		
OUTPUT 3	15V	0A	14A	210W		
OUTPUT 4	-15V	0A	14A	210W		

Notes:
1. maximum individual output power ratings when totaled together must not exceed the total power ratings for each input line voltage setting.

3.3.3 Output Voltage Tolerances

All DC output voltages must remain inside the following limits for any combination of line input voltage, load currents, and ambient temperature (outside the chassis):

Nominal Voltage	Tolerance
1.5 to 60V	±1%

3.3.3.1 Capacitance Load

All loads have incrementally positive-resistance characteristics.

Load capacitances are as follows:

Output	Load Capacitance (μF) Minimum	Load Capacitance (μF) Maximum
1.5 to 60V	0	5000

3.3.4 Voltage Regulation

3.3.4.1 Line Regulation

Less than 0.1% from 100Vac to 240Vac with the output loaded to full output power.

3.3.4.2 Load Regulation

Less than 0.5% from minimum load to maximum load measured at the point of connection of the sense leads to the output terminals.

3.3.4.3 Cross Regulation

N/A

3.3.4.4 Total Regulation

Output	Total Regulation Fully Regulated Outputs
1.5 to 60VDC	1% Maximum

Total regulation is defined as the maximum deviation from the set voltage due to the combined effects of line and load regulation.

3.3.4.5 Minimum Load For Regulation

Minimum load for regulation to specification for all models is as follows:

Minimum Load
0A

3.3.5 No Load Operation

Under no load on the output the power supply shall:

-Start into no load without exhibiting any instability such as hiccup or recycling behavior

-Start into no load without exhibiting overshoot

-Operate continuously at no load without any degradation of reliability or thermal performance

The power supply shall be able to meet the above performance and regulation requirements over the full specified line range.

3.3.6 Long Term Drift

The output voltages shall have time dependent change of less than 0.5% per 1000 hours of continuous operation after 15 minute warm up period.

3.3.7 Thermal Drift

The output voltage deviation with respect to temperature shall be less than 0.02%/°C or 1mV/°C, whichever is greater, over the operating temperature range after a 15 minute warm up period .

3.3.8 Output Ripple And Noise

3.3.8.1 Ripple and Noise

Noise and ripple on the outputs will not exceed ±3% (peak to peak) of the nominal output voltage setting measured over a 20 MHz bandwidth.

3.3.8.2 Common Mode Noise

TBD

3.3.9 Stability

TBD

3.3.10 Transient Response

3.3.10.1 Load Transient

The output voltage transient deviation with load change is specified by the table below for a load change rate of 0.5 A/µsec. The main output shall be loaded to a minimum of 10% of its specified nominal rated load current. All tests are performed iwth local sense at the output terminals.

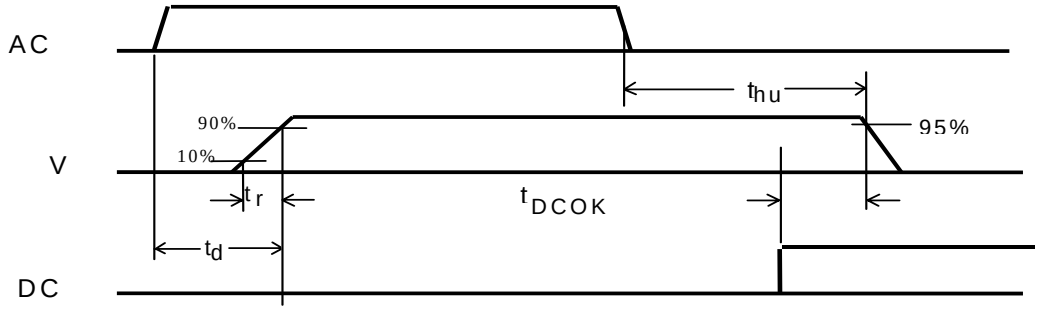
Output	Load Change	Applicable load range	Max Transient Deviation	Settling Characteristic
1.5-60V	±20%	10-100%	3% or 150mV	To 1 % of final value in 300µsec

3.3.10.2 Load Transient Interaction

N/A

3.3.11 Turn On / Off Transients

The following timing diagram is applicable to subsequent timing definitions.



All outputs shall rise monotonically during start up or restart (recovery from short, overload, or OVP conditions) and shall not overshoot their final settings. Removal of AC input shall cause the output voltages to decay monotonically to zero.

3.3.12 Turn-on Delay Time

$t_d \leq 1$ sec @ 100 Vac
$t_d \leq 1$ sec @ 120 Vac
t_{DCOK} =100 to 500µs
$t_{hu} \geq 20$ msec

3.3.13 Power Fail Warning

Not applicable.

3.3.14 Power Good

A TTL signal called DC_OK will pull active low to indicate satisfactory operation of the power supply. DC_OK will go high immediately in the event of a hardware fault within the power supply (including a fan failure), and will go high at least 10ms before the output goes out of regulation in the event of a loss of AC input power. This signal is located in CN2 interface connector.

3.3.15 Hold Up Time

Output regulation shall be maintained with loss of AC input per the following specifications. Hold up time shall be measured from the last peak of the AC line to the time at which Vo1 drops 5% from its set value.

Po	**Vin**	**t_{hu} min**
1200W	>85Vac	20 msec

3.3.16 Remote Sense

Remote sense capability shall be provided for all models and will compensate for a maximum of 65 mV as measured at the output connector pins. The plus and minus remote sense line connections are located at the CON5 connector on each 200W module.

3.3.17 Overload and Short Circuit Requirements

The power supply shall be protected against short circuits and output overload. Overload and short circuit behavior shall be per the following table:

Fully regulated models:

Output	Current limit Onset, Ionset/Ipk	Current limit knee/hiccup Ik/Ipk
Vo1-8	110% - 135%	N/A

NOTE: The unit will be able to survive power-on with a hard short circuit connected to any of its DC output connectors, without incurring damage.

3.3.18 Over Voltage Protection

Overvoltage protection shall be set between 125% and 135% of the nominal output voltage setting.

3.3.19 Reverse Voltage Protection

Outputs shall not be damaged when reverse biased by a source of current limited to the output rating.

3.3.20 Redundant Operation

These modules have incorporated as a standard feature an OR'ing function before the output terminals to provide isolation to other parallel connected modules. This feature prevents system shutdown in the event of a single point failure in a module when connected in a redundant output configuration. This OR'ing feature shall not allow more than 0.15VDC drop across the circuit when the module is "on" and will provide protection against reverse voltage application to the output terminals and external fault protection in a redundant configuration.

3.3.20.1 Current Share

Single wire current share pin input is provided that will force 2 or more models of the same output type to share the system load requirement. When modules are connected by this single wire interface, the individual modules will share the output current (parallel connected) to within ±10% of each other. This signal pin is compatable only with HiTek Power Hiflex series DC DC converter modules. The voltage at this pin is measured at between 2.0VDC at approximately 10% load and 4.0VDC at full load. This voltage rises linearly as the output load increases.

3.3.20.2 Hot Swap

N/A

3.3.21 Current Monitor

A current monitor pin is supplied that reflects the current share voltage while providing isolation to the current share circuit to prevent end user induced catastrophic failure.

3.3.22 Fan Output

N/A

3.4 Brown-out / Drop-out

See section 3.2.9.1

3.5 EMC

The power supply shall not limit the end product acceptance to the requirements of the EMC generic immunity standard EN50082-1. Note that the EMC directive 89/336/EEC requires conformance to:

EN61000-4-2	ESD (end equipment only)
EN61000-4-3	RF Susceptibility (end equipment only)
EN61000-4-4	Fast transient bursts (applicable to power supply)

Although not specifically required, this product will be subjected to ESD and RF immunity tests.

Note that IEC 1000-4-5 for Surge Immunity is not now a part of the EMC Directive but is listed as a requirement for this product.

3.5.1 ESD Immunity: IEC 1000-4-2 : 1993 draft Level TBD (IEC801-2) ***TBD***

The power supply shall be tested in accordance with the standard.
The outputs shall not go beyond specified regulation limits and the power fail detect signal shall not activate. Unit shall continue to operate and not hiccup or shutdown. No permanent damage shall occur.

3.5.2 RF susceptibility: IEC 1000-4-3 : 1992 draft Level TBD (IEC801-3) ***TBD***

The power supply shall be tested in accordance with the standard.
The outputs shall not go beyond specified regulation limits and the power fail detect signal shall not activate. Unit shall continue to operate and not hiccup or shutdown. No permanent damage shall occur.

3.5.3 Fast Transient/Burst Immunity: IEC 1000-4-4 : 1993 draft Level TBD (IEC 801-4) **TBD**

The outputs shall not go beyond specified regulation limits and the power fail detect signal shall not activate. Unit shall continue to operate and not hiccup or shutdown. No permanent damage shall occur.

3.5.4 Surge Immunity: IEC 1000-4-5 1993 draft Class TBD (IEC 801-5) ***TBD***

The outputs shall not go beyond specified regulation limits and the power fail detect signal shall not activate. Unit shall continue to operate and not hiccup or shutdown. No permanent damage shall occur. Five each plus and minus polarity are required for an outcome and are to be applied at the peak and zero crossing of the line voltage. The source impedance used will be 2 ohms and shall be performed at 115 Vac and 230 Vac.

3.6 EMI - Conducted and Radiated

The power supply shall not limit the end product acceptance to the requirements of EN50081-1.
The power supply shall meet the following requirements:
FCC CFR Title 47 part 15 Class B
EN55022 / CISPR 22 Class B

The power supply shall be tested and reviewed for radiation as a stand alone unit and the results shall be documented and available to customers. The power supply shall not be required to meet radiated noise requirements as a stand alone product.

3.7 Power Limit Requirements

N/A

3.8 Over Temperature Protection

The power supply is protected in the event of excessive operating ambient, blocked cooling air, or sustained operation below rated input voltage.

3.9 Efficiency

The efficiency of the unit shall be 75% min when fully loaded on all outputs at 230VAC line voltage.

3.10 Inhibit

The Inhibit feature is available thru the front panel interface connector. To enable the shutdown feature, a TTL active high signal will disable the output, a TTL low signal or open circuit will cause the output to rise to normal state.

4 Mechanical Requirements

Outside mechanical dimensions of the power supply will be such as to permit direct compatible installation into a system chassis.

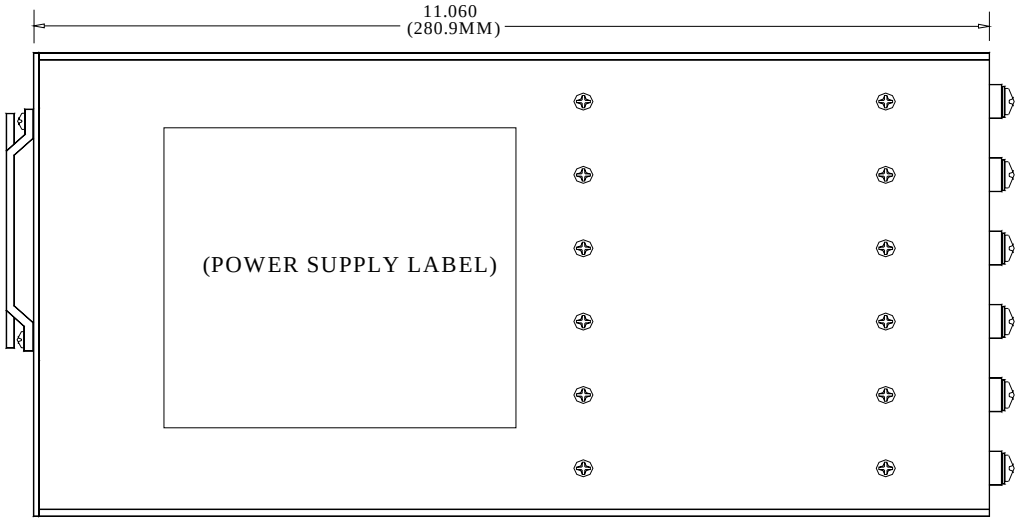
The weight shall not exceed 6 lbs.

4.1 Maximum Dimensions

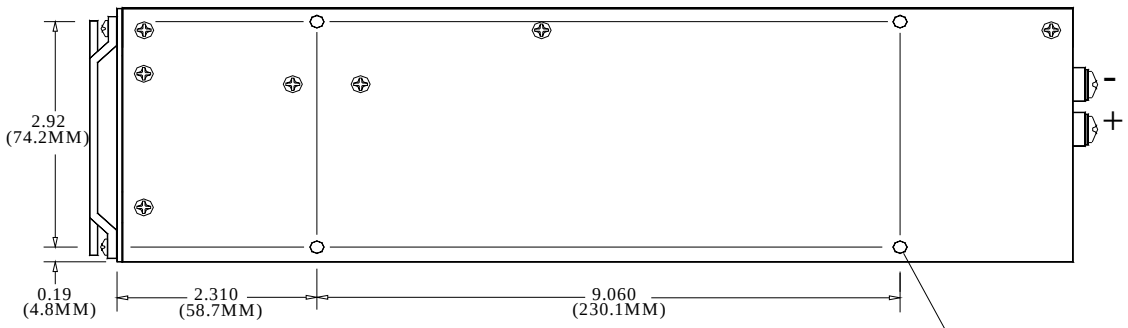
See Section 4.2

4.2 Outline and Mounting

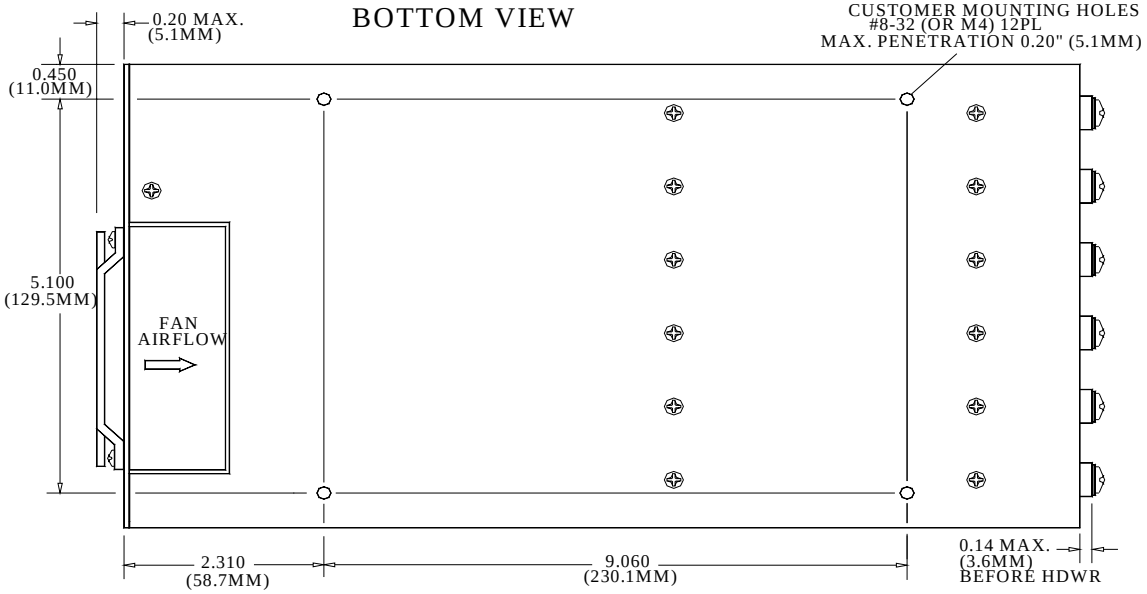
TOP VIEW

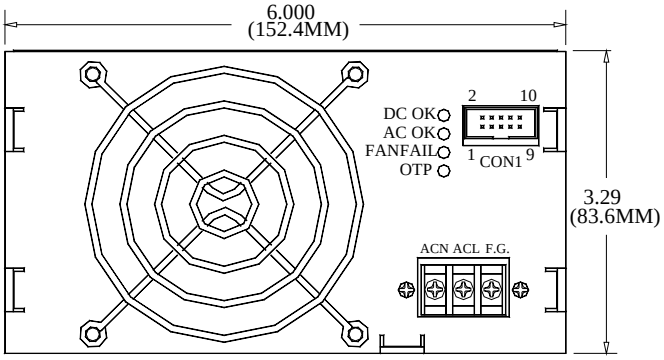


SIDE VIEW



BOTTOM VIEW

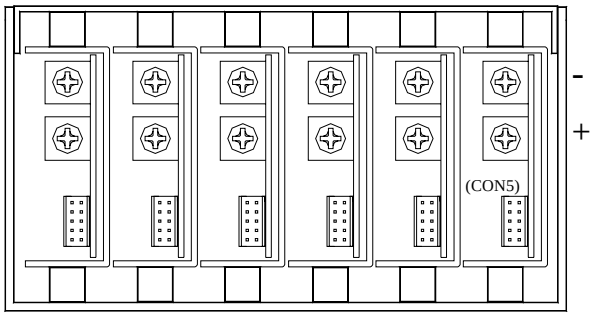




FRONT PANEL

CON1 INTERFACE

PIN#	SIGNAL
1	5Vsb RTN
2	5Vsb RTN
3	GLOBAL DCOK "C"
4	5Vsb +
5	GLOBAL DCOK "E"
6	GLOBAL NON-ISOLATED INH
7	ACOK "C"
8	GLOBAL ISOLATED INH +
9	ACOK "E"
10	GLOBAL ISOLATED INH -



OUTPUT END

CON5 MODULE INTERFACE

PIN#	SIGNAL
1	CURRENT MONITOR
2	+ REMOTE SENSE
3	CURRENT SHARE
4	- REMOTE SENSE
5	MODULE ISOLATED INH +
6	MODULE ISOLATED INH -
7	MARGIN HI - TIE TO PIN 8
8	MARGIN HI - TIE TO PIN 7
9	MARGIN LO - TIE TO PIN 10
10	MARGIN LO - TIE TO PIN 9

4.3

Connections

4.3.1 Type Identification

See Outline Drawings Section 4.2

4.4 Marking and Labeling

TBD

5 Environmental Requirements

Temperature	Operating	0°C to +40°C
	Non-Operating	-20°C to +85°C
Altitude	Operating	10,000 feet
	Non-Operating	40,000 feet
Relative Humidity	Non-condensing	5% to 95%
Shock & Vibration	Operating	Frequency 5 to 50Hz Acceleration ±7.35M/(SxS) Direction X, Y and Z axis

6 Safety And Regulatory Agency Requirements And Approvals

The product shall meet the requirements of the European EMC directive 89/336/EEC and display a CE mark showing conformance to this requirement.

6.1 Designed to Meet the Following Safety Regulatory Standards:

EN 60555-2
UL1950
CSA C22.2 No 234 (Canadian Electrical Std, 234 for power supplies, 950 equiv.)
EN 60950

CB Report

6.2 Agency Approvals

UL - UL1950
CSA -C22.2 234
TUV-EN60950
CE Mark
Approved as required.

6.3 Ground Leakage

Ground leakage current shall be less than 3.5mA @ 110 Vac, 60 Hz. using the UL1950 and CSA C22.2 234 test methods. Leakage current shall be less than 1mA @ 254 Vac, 50 Hz. using the EN60950 test method.

6.4 Ground Continuity

Ground continuity shall be less than 0.1 Ohm between earthing terminal and earthed dead metal parts. The impedance and test conditions to be met are as follows:

Impedance, Ohms	0.10 max
Open Ckt Test Voltage	6Vmin to 12Vmax
Short Ckt Test Current	30A

6.5 Output Isolation

50 Vdc minimum between outputs to chassis.

7 Reliability

MTBF shall be greater than 150,000 hours calculated to MIL-217 RevF at 25°C ground benign.

8 Cooling

The CHF12 series power supply's incorporate one (1) internal cooling fan with a minimum of 32 CFM airflow rating.

Certificate of Compliance

Customer Part Number	LHV/HiTek Part Number	RoHS Compliant
1140-01342	HF12-S-M-Q-Q-203	Yes
1140-00348	HF12-S-M-Q-N-N-Q-W-Q	Yes
1140-00349	HF12SM-Q-Q-QQ-203-W	Yes
1140-00350	HF12-S-M-Q-N-N-Q-Q-Q	Yes
	HF10A-SM-QQ-203	Yes

Attention Incoming Inspection:

It is hereby certified that all articles in the quantities as called for in the above purchase order are in conformance with the requirements, specifications, and drawings listed on that order. All of the parts are RoHS compliant. Records substantiating the above statement are available in our files for inspection by authorized personnel.

10/30/08

Director of Quality, or designee Date: