



Avionic Instruments

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# CATALOG

## Frequency Converters | 2020



# APPLICATIONS & QUALIFICATIONS



## OVERVIEW

Our Frequency Converters can provide flexible output configurations from

115 VAC / 60 Hz  
230 VAC / 50 Hz

100 VAC / 60 Hz  
230 VAC / 60 Hz

for convenience power applications for commercial transport aircraft, helicopters, military aircraft and other military critical applications. These units also can be configured to 115 VAC / 400 Hz to power critical avionic systems and mission equipment.

The 3.5 KVA unit offers the flexibility of:

Three Phase Operation for 10.5 KVA (Non-Parallel)  
Single Phase Operation up to 17.5 KVA (Paralleled)  
Three Phase Operation up to 52 KVA (Paralleled)

We can provide full qualification reports to commercial aerospace requirements such as RTCA-DO-160E and military specifications such as MIL-STD-704F/ MIL-STD-810E/MIL-STD-461E. Our products have been qualified and certified with Aerospace customers such as Gulfstream, Boeing, Airbus, Lockheed Martin/ Sikorsky, Embraer and Leonardo. In addition, we have worked closely with global Aerospace completion companies to incorporate 50 Hz, 60 Hz and 400 Hz power as part of their value added system and component integration process.







## Frequency Converter | Applications



**Commercial**

### Commercial

### Applications

- 115 VAC / 60 Hz or 230 VAC/50 Hz Convenience / Outlet Power
- 115 VAC / 400 Hz Power Conditioning – Critical Avionics Power
- Direct Infrared Counter Measures (DIRCM)
- VIP Interior Upgrade with Power Outlets
- In-Flight Entertainment Equipment
- Passenger Personal Electronic Devices
- Flight Deck EFBs, iPads, etc.
- Galley Microwave Ovens, Coffee Makers & Refrigerators
- Medevac Instruments, Vacuum Pumps, etc.



**Military**

### Military

### Applications

- 115 VAC / 60 Hz or 230 VAC / 50 Hz Convenience / Outlet Power
- 115 VAC / 400 Hz Power Conditioning – Critical Avionics Power
- 3 Phase 115 VAC / 400 Hz Conditioning to Power high capacity radars
- Direct Infrared Counter Measures (DIRCM)
- Support 400 Hz Power for Mission Equipment
- Medevac Instruments, Vacuum Pumps, etc.
- Flight Deck EFBs, iPads, etc.
- Galley Microwave Ovens, Coffee Makers & Refrigerators
- Special Mission ISR Equipment, Cooling Systems, Etc.
- Portable Utility Power



# Advantages

Avionic Instruments latest generation of 3.5 KVA Frequency Converter product family offers market leading weight at 23 Lb's (10.4 Kg's).

The unit provides galvanic isolation via a 12 pulse TRU front end with a patented output section that switches at high frequency and operates safely when exposed to overload and short circuit conditions.

Our product line now includes all new "smart" DSP (Digital Signal Processor) controlled 875 VA, 1 KVA and 1.5 KVA frequency converters, which set new standards for SWaP.

The base 875 VA Multiple Output Frequency Converter design was qualified and certified to power medical outlets on the Boeing 787 platform.







## Frequency Converter | Advantages



Analog

### 3.5 KVA

### Analog Design

- Reliable design with MTBF > 30K Hours
- Power Density at 152 VA / LB (3.5 KVA / 23 Lb's)
- 1% voltage line/load regulation
- High Efficiency > 85% (above 50% load) with high overload capacity
- High Input Power Factor > 0.95 PF (above 50% load)
- 12 Pulse Topology with THD < 12%
- Meets DO-160G Power Quality Requirements
- Ability to operate with wild frequency input 320 Hz to 800 Hz
- Design has been qualified to Military Standards



Digitally Controlled

### 875 VA / 1 KVA / 1.5 KVA DSP

### Digitally Controlled Design

- Highly reliable design with MTBF > 200K hours
- Digital Maintenance Port supports "smart" field maintainability
- Single phase wild frequency compatibility (320 Hz to 800 Hz)
- Active power factor correction (320 Hz to 800 Hz)
- 1% voltage line / load regulation
- High Efficiency > 85% (above 50% load) with high overload capacity
- Meets DO-160G Power Quality Requirements



# Frequency Converter Options

Part Number	Model #	Power Level	Input	V - Out	F - Out	Weight (LB/KG)	Dimensions (L"   H"   W")	Options
<b>3.5 KVA Frequency Converter   Product Offerings</b>								
1-002-0102-1943	4C3500-1A-1943	3.5 KVA	Three Phase	115 VAC $\pm$ 3 VAC	60 Hz $\pm$ 1 Hz	23 LB / 10.43 KG	17.2   5.8   7.0	Input Circuit Breaker / Input Relay
1-002-0102-2499	4H3500-1A-2499	3.5 KVA	Three Phase	115 VAC $\pm$ 3 VAC	60 Hz $\pm$ 1 Hz	25 LB / 11.4 KG	17.2   5.8   7.0	Circuit Breaker / Wild Input Frequency
1-002-0102-2549	4H3500-1B-NB-2549	3.5 KVA	Three Phase	115 VAC $\pm$ 3 VAC	60 Hz $\pm$ 1 Hz	23 LB / 10.43 KG	17.2   5.8   7.0	Relay / Wild Input Frequency
1-002-0102-2444	4H3500-GIVX-2444	3.5 KVA	Three Phase	115 VAC $\pm$ 3 VAC	60 Hz $\pm$ 1 Hz	27 LB / 12.2 KG	19.2   5.8   7.0	Relay / Wild Input Frequency / High Altitude
1-002-0102-2503	4H3500-3A-NBH-2503	3.5 KVA	Three Phase	230 VAC $\pm$ 6 VAC	50 Hz $\pm$ 0.5 Hz	25 LB / 11.4 KG	17.2   5.8   7.0	Relay / Wild Input Frequency
1-002-0102-2559	4H3500-3A-NBH-RT-2559	3.5 KVA	Three Phase	230 VAC $\pm$ 6 VAC	50 Hz $\pm$ 0.5 Hz	25 LB / 11.4 KG	17.2   5.8   7.0	Relay / Paralleling Capability
1-002-0102-2364	4H3500-4E-NBHR-2364	3.5 KVA	Three Phase	115 VAC $\pm$ 3 VAC	400 Hz $\pm$ 3 Hz	28 LB / 12.7 KG	17.2   5.8   7.0	3 Phase / Paralleling Capability
1-002-0102-2341	4H3500-1E-NB-2341	3.5 KVA	Three Phase	115 VAC $\pm$ 3 VAC	60 Hz $\pm$ 1 Hz	27 LB / 12.2 KG	17.2   5.8   7.0	Relay / Paralleling Capability
<b>875 VA / 1 KVA / 1.5 KVA DSP based Frequency Converter   Product Offerings</b>								
1-002-0102-2447	4H875-MOFC-2447	875 VA	Single Phase	Output Voltage Selectable [100, 110, 115, 220, 230, 240] ( VAC )	Frequency Selectable [400, 60, 50] ( Hz )	9 LB / 4.1 KG	10   6   5	Digital Controlled Design - Single Phase Input with Active Power Factor Correction
1-002-0102-2555	4H1500-MOFC-28VDC-2555	1.5 KVA	Three Phase	115 VAC $\pm$ 3 VAC & 28 VDC	60 Hz $\pm$ 1 Hz	15 LB / 6.8 KG	17.2   5.8   7.0	Circuit Input Breaker / Wild Input Frequency 12 Pulse TRU Front End
1-002-0102-2455	4H3500-MOFC-2455	3.5 KVA / 500 W	Three Phase	Output Voltage Selectable [115, 220] ( VAC ) 28 VDC - 500W	Frequency Selectable [60, 50] ( Hz )	35 LB / 15.9 KG	10   6   5	Digital Controlled Design With 12 Pulse TRU Front End
<b>15 KVA 3-Phase 115 VAC L-N Frequency Converter   Product Offerings</b>								
1-002-0102-2509	6H15000-MA-2509	15 KVA	Three Phase	3 Phase, 115 VAC L-N	400 Hz $\pm$ 3 Hz	108 LB / 49 KG	19   16   15	Digital Controlled Design with 3 phase monitor functionality



# Performance Levels

3.5 KVA FC PERFORMANCE LEVELS	
INPUT VOLTAGE	115 / 200 VAC, Three Phase WYE, nominal 108 to 118 VAC L-N, normal Power interruptions as per Mil-Std-704F
INPUT FREQUENCY	320 - 800 Hz
INPUT CURRENT	12.5 A (typical)  15 A per phase, maximum, for rated load and nominal input Input current total harmonic distortion less than 5%.
INPUT POWER FACTOR	Not less than 0.9 Lagging and less than or equal to unity from half to full load
OUTPUT VOLTAGE	Output can be configurable to:  100 VAC $\pm$ 2.5 VAC 115 VAC $\pm$ 3.0 VAC 230 VAC $\pm$ 6.0 VAC single phase, for normal input range
OUTPUT FREQUENCY	Output can be configurable to: 400 Hz, 60 Hz or 50 Hz
OUTPUT POWER	3500 VA, nominal
OUTPUT WAVESHAPE	1.5% THD (typical) 5.0% maximum, normal operation
OUTPUT POWER FACTOR	0.75 lag to 0.8 lead
EFFICIENCY	87% (typical) 85% minimum at full load
OVERLOAD	3850 VA for 2 hours   4300 VA for 5 minutes 200% short circuit current
PROTECTIONS	Output Overvoltage Output Over / Under Frequency Over-Temperature Short Circuit Input Over / Under-Voltage
TEMPERATURE RANGE	-55° to +71°C ambient, operating -65° to +85°C ambient, storage

875 VA DSP FC PERFORMANCE LEVELS			
INPUT VOLTAGE	115 VAC, Single Phase, nominal 108 to 118 VAC L-N, normal Power characteristics as per 787B3-0147		
INPUT FREQUENCY	360 - 800 Hz		
INPUT CURRENT	10.0 A (typical)  12.5 maximum, for rated load and nominal input Input current total harmonic distortion less than 5%.		
INPUT POWER FACTOR	Not less than 0.98 Lagging and less than or equal to unity from half to full load		
OUTPUT CONFIGURATIONS	The following outputs are available via pin selectable jumper settings:		
	100 VAC $\pm$ 3 VAC 115 VAC $\pm$ 3 VAC 115 VAC $\pm$ 3 VAC 115 VAC $\pm$ 3 VAC 230 VAC $\pm$ 6 VAC 230 VAC $\pm$ 6 VAC 230 VAC $\pm$ 6 VAC	50 Hz 50 Hz 60 Hz 400 Hz 50 Hz 60 Hz 400 Hz	Single Phase Single Phase Single Phase Single Phase Single Phase Single Phase Single Phase
OUTPUT POWER	875 VA, nominal		
OUTPUT WAVESHAPE	1.5% THD (typical) 5.0% maximum, normal operation		
OUTPUT POWER FACTOR	0.75 lag to 0.8 lead Not damaged by any power factor		
EFFICIENCY OVERLOAD	87% (typical) 85% minimum at full load		
PROTECTIONS	Output Overvoltage Output Over / Under Frequency Over-Temperature Short Circuit Input Over / Under-Voltage		
TEMPERATURE RANGE	-40° to +70°C ambient, operating -55° to +85°C ambient, storage		



# Performance Levels

## 15 KVA 3-Phase 115 VAC L-N

### FC PERFORMANCE LEVELS

INPUT VOLTAGE	115 / 200 VAC, Three Phase WYE, nominal 108 to 118 VAC L-N, normal Power interruptions as per Mil-Std-704F
50 MS INTERRUPTION	The frequency converter will shut-down at the onset of the 50 ms interruption and it will recover to at least 80 VRMS by the end of the 50 ms interruption
INPUT FREQUENCY	324 - 596 Hz
INPUT CURRENT	45 A (typical) 52 A per phase, maximum, for rated load and nominal input Input current total harmonic distortion less than 10%
INPUT POWER FACTOR	Not less than 0.9 Lagging and greater than 0.95 from half to full load
OUTPUT VOLTAGE	115 VAC $\pm$ 3 VAC Line to neutral voltage, for normal input range, no load to full load over the full temperature range Transients per MIL-STD-704E
OUTPUT FREQUENCY	400 Hz $\pm$ 4 Hz
OUTPUT POWER	15000 VA, nominal
OUTPUT WAVESHAPE	3.0% THD (typical) 5.0% maximum, normal operation
OUTPUT POWER FACTOR	0.8 lag to 0.9 lead Not damaged by any power factor
EFFICIENCY OVERLOAD	87% (typical) 85% minimum at full load
PROTECTIONS	Output Overvoltage Output Over / Under Frequency Over-Temperature Short Circuit Input Over / Under-Voltage
TEMPERATURE RANGE	-40° to +71°C ambient, operating -55° to +85°C ambient, storage

## 1.5 KVA DSP

### FC PERFORMANCE LEVELS

INPUT VOLTAGE	115 / 200 VAC, Three Phase WYE, nominal 108 to 118 VAC L-N, normal Power interruptions as per Mil-Std-704F
INPUT FREQUENCY	380 - 420 Hz
INPUT CURRENT	5 A (typical) 5.5 A maximum, for rated load and nominal input Input current total harmonic distortion less than 5%
INPUT POWER FACTOR	Not less than 0.90 Lagging and less than or equal to unity from half to full load
OUTPUT VOLTAGE	Output can be configurable to: 115 VAC $\pm$ 3.0 VAC 230 VAC $\pm$ 6.0 VAC 28 VDC unregulated Secondary output available
OUTPUT FREQUENCY	Configurable to 50 Hz / 60 Hz / 400 Hz
OUTPUT POWER	1.5 KVA, nominal
OUTPUT WAVESHAPE	1.5% THD (typical) 5.0% maximum, normal operation
OUTPUT POWER FACTOR	0.75 lag to 0.8 lead Not damaged by any power factor
EFFICIENCY OVERLOAD	87% (typical) 85% minimum at full load
PROTECTIONS	Output Overvoltage Output Over / Under Frequency Over-Temperature Short Circuit Input Over / Under-Voltage
TEMPERATURE RANGE	-40° to +71°C ambient, operating -65° to +85°C ambient, storage





REQUIREMENT	DO-160	SECTION	CATEGORY
Ground Survival Low Temperature	D	4	F2
Ground Survival High Temperature	D	4	F2
Operating Low Temperature	D	4	F2
Operating High Temperature	D	4	F2
Altitude	D	4	F2
Decompression	G	4.6.2	A4 (43,100 Feet)
Overpressure	G	4.6.3	A4 (-19,000 Feet)
Temperature Variation	D	5	B
Humidity	D	6	B
Operational Shock	D	7	B
Crash Safety Shock (Impulse & Sustained)	D	7	B
Vibration	D	8	R (Curves C & C1)
Explosion Proofness	D	9	E
Waterproofness	G	10	Y
Fluids Susceptibility	D	11	F
Sand & Dust	D	12	D
Fungus	D	13	F
Salt Fog	D	14	S
Magnetic Effect	G	15	C
Power Input	G	16	A(WF)
Current Modulation	G	16.7.6	A(WF)
Power Factor	G	16.7.8	A(WF)
Voltage Spike	D	17	A

REQUIREMENT (Continued)	DO -160	SECTION	CATEGORY
Audio Frequency Susceptibility	G	18.3.1 & 18.3.2	R(WF)
Audio Frequency Magnetic Field Susceptibility Equipment	G	19.3.1	ZNX
Audio Frequency Electric Field Susceptibility Wiring	G	19.3.4	ZNX
Audio Frequency Magnetic Field Susceptibility Wiring	G	19.3.3	ZNX
Induced Spikes Susceptibility	G	19.3.5	ZNX
Audio Frequency Emissions	G	8.1.1	
Radio Frequency Susceptibility (Radiated)	G	20.4	R
Radio Frequency Susceptibility (Conducted)	G	20.5	R
Radio Frequency Emissions (Radiated)	D	21	B
Radio Frequency Emission (Conducted)	D	21	B
Lightning Induced Transient Susceptibility	D	22	A3C3X
Electrostatic Discharge	D	26	A



Avionic Instruments

## Power Conversion



RTR/TRU  
Frequency Converter  
Static Inverters  
DC-DC Light Dimmer

## Power Distribution



Mission Switching Unit  
PDU

## Energy Storage



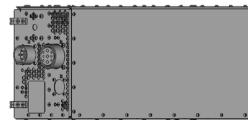
Batteries  
Battery Chargers  
Battery Control Units  
Battery Relay Control Units  
Emergency Battery Backups

## Cooling Solutions



AC Cooling Solutions  
DC Cooling Solutions

## Custom Solutions



Custom static inverters,  
frequency converters,  
transformer rectifier units  
(TRUs), light dimmers  
and power supplies for  
the most demanding  
customers.

## Services



We operate fully certified  
FAA-approved Part 145  
repair stations in:

Avenel, NJ  
Tempe, AZ

# Contact Us

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