

# GEN IV Klystron High Power Amplifier

## Highly Efficient

Provides up to 2.45 kW of output power. Multi-stage depressed collector klystron allows the amplifier to use less power and produce less heat than other K-HPAs. Employs a power saver feature to optimize K-HPA efficiency to meet your operating condition.

## Technologically Up to Date

Scopescreen provides a graphical log display. Ethernet option provides higher speed connections, can update and coordinate all clock settings, and enables a snapshot feature where user can create a file containing all settings, alarms and faults at a single point in time.

## Small Size

Greater efficiency and exceptional thermal margins have enabled CPI to design the smallest KPA on the market --- without the threat of overheating or a shorter klystron life.

## Greater Reliability

Low temperatures are the key to longer lifetimes for klystrons and electronic parts. The CPI power supply design and high efficiency, multi-stage depressed collector klystron make these lower temperatures possible. K-HPA MTBF is nearly 90,000 hours.

## Useful Displays

Large, high quality, color, graphical display has a wide viewing angle and a sharp appearance. All important functions are clearly displayed, and an event log is included.

## Easy Maintenance, Easy Handling

All areas of the amplifier are easily accessible and there are no large harnesses to get in the way. Separate RF and Power Supply drawers slide out from a standard rack.

## Worldwide Support

Backed by over 35 years of satellite communications experience, and CPI's worldwide 24-hour customer support network that includes more than 20 regional factory service centers.



## Model K4U

Klystron Power Amplifier  
for **satellite uplink applications**

### OPTIONS

- Motorized channel selector (<1 second)
- Remote control panel
- Integral linearizer
- Redundant and combined systems
- External receive band reject filter
- L-band block upconverter (BUC) --- specifications for when BUC is included are not contained in this document. Contact CPI for details.
- Ethernet interface



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## Ku-band GEN IV Klystron High Power Amplifier

Specification	Model K4U		
Output Frequency	13.75 to 14.50 GHz	12.75 to 13.25 GHz	14.0 to 14.8 GHz
Output Power with Harmonic Filter <sup>1</sup> Klystron CW Power Flange CW Power (min.)	2.45 kW (63.89 dBm) min. 2.00 kW (63.01 dBm) min.	2.45 kW (63.89 dBm) min. 2.00 kW (63.01 dBm) min.	2.45 kW (63.89 dBm) min. 1.95 kW (62.91 dBm) min.
Instantaneous Bandwidth	85 MHz	80 MHz	85 MHz
Gain at rated power	77 dB min.		
Gain Stability vs. Time	±0.25 dB/24 hr. max. at constant drive and temperature		
Gain Stability vs. Temperature	1 dB max. from 20° to 40°C; ±2.5 dB max. from 0° to 50°C (at constant drive)		
Gain Slope at Rate Power	0.04 dB/MHz max. over Fo ±30 MHz		
Gain Variation at Rated Power	0.4 dB pk-pk max. over Fo ±30 MHz		
Input/Output VSWR	1.25:1 max. input; 1.30:1 max. output		
Load VSWR	2.0:1 max. for full spec. compliance; any value for operation without damage		
Residual AM <sup>2</sup>	-50 dBc max, 20 to 400 Hz; -60 dBc max, 400 Hz to 2 kHz; -80 dBc max, 2 kHz to 500 kHz		
AM/PM Conversion	4°/dB max. at rated power		
Harmonic Output	-80 dBc with filter; -35 dBc without filter		
Noise and Spurious	-135 dBW/4 kHz, 11.70 to 12.75 GHz; -65 dBW/4 kHz, passband -60 dBW/4 kHz, passband with linearizer; -110 dBW/MHz, 12.75 to 40 GHz, excluding passband	-135 dBW/4 kHz, 10.70 to 11.70 GHz; -65 dBW/4 kHz, passband -60 dBW/4 kHz, passband with linearizer; -110 dBW/MHz, 11.75 to 40 GHz, excluding passband	-135 dBW/4 kHz, 11.70 to 12.75 GHz; -65 dBW/4 kHz, passband -60 dBW/4 kHz, passband with linearizer; -110 dBW/MHz, 12.75 to 40 GHz, excluding passband
Intermodulation	-28 dBc with regard to each of two equal carriers at 7 dB backoff from rated output power		
Phase Noise	Exceeds requirements of IESS-308/309 by -10 dB at 10 dB backoff		
Group Delay	In any 72 MHz band: 0.10 ns/MHz linear max; 0.02 ns/MHz <sup>2</sup> parabolic max; 2.0 ns pk-pk ripple max.		
Primary Power <sup>3</sup>	All ratings are ±10%; Frequency: 47-63 Hz, 5 wire, 3 phase with ground; 208 VAC (with or without neutral); 380 to 415 VAC		
Power Consumption <sup>4</sup>	8.0 kW max; typical values for the following RF output backoffs with respect to rated (power saver OFF): 7.7 kW at 0 dB (rated); 5.6 kW at -4 dB; 4.9 kW at -7 dB; -4.6 kW at -10 dB; -4.5 kW at -13 dB		
Power Factor	0.9 min.		
Inrush Current, peak	180% of normal line current peak max. (first half-cycle only)		
Ambient Temperature	-10°C to +50°C operating, -54°C to +71°C non-operating		
Relative Humidity	95% non-condensing		
Altitude	10,000 ft. with standard adiabatic derating of 2°C/1000 ft. operating; 40,000 ft. non-operating		
Shock and Vibration	As normal encountered in satellite earth stations and shipping		
Cooling	Forced air with integral blower and fans; separate klystron collector cooling path		
Air Flow Rate, Klystron	250 cfm min. at sea level		
External Ducts Back Pressure	0.5 inch water gauge total, max.		
Klystron Heat Loss	4400 W max.		
Heat Loss in Room	Cabinet less klystron: 1700 W max.		
Acoustic Noise	63 dBA nom, measured 3 ft from front of equipment		
Connections	RF Input: Type N Female; RF output: WR-75 waveguide flange, grooved; RF output monitors: Type N Female		
M&C Interface	RS422/485, RS232 serial interface; Ethernet optional		
Dimensions, W x H x D	RF Drawer: 19 x 17.5 x 28 inches (483 x 445 x 711 mm); Power Supply: 19 x 8.75 x 24 in. (483 x 223 x 610 mm)		
Weight	RF Drawer: 220 lbs with klystron (100 kg) nom; Power Supply: 100 lbs (45.4 kg)		

Notes: 1. Harmonic filter can be removed as an option. Add 0.25 dB to amplifier output for units ordered without harmonic filter. Output VSWR without filter is 1.25:1 max.

2. Prime power AC line unbalance not to exceed 3%. Excess imbalance may cause an increase in residual RF noise (AM, FM and PM). Phase noise increase is typically 2.5 dB / % imbalance.

3. AC current harmonic content: less than 20%, primarily fifth and seventh harmonics. Harmonics must be considered when choosing UPS sources.

4. Lower power consumption can be achieved if power saver (included as standard) is employed when operating below rated output power.