



Communications & Power Industries
beverly microwave division

HEATWAVE TECHNICAL DATA

VIS-102B
2.45 GHz, 60 KW

**Industrial
Microwave
Power System**

This data sheet supersedes any technical data sheet having a
date prior to
March 15, 2006

DESCRIPTION

This integrated industrial microwave power system uses a CPI VKS-7960A klystron, designed for industrial service, as the energy source. By using the high-efficiency, 2.45-GHz, 60 kW CW klystron in combination with modern control and power-supply technology, CPI is able to furnish a compact, user-friendly, cost-effective industrial system.

The system's control center is an embedded microprocessor architecture which provides flexibility in selecting system operating parameters. Operation is initiated by two independent external enable commands. Control of the system is through a web-based browser via a direct Ethernet or web-based connection. Operational data is logged in the controller's on-board flash memory. The logged data may be uploaded to the external computer via the Ethernet connection for use in off-line troubleshooting or other purposes.

The high-voltage power supply consists of a phase-angle adjustable SCR controller, a step-up transformer and a full-wave-bridge rectifier. There is no filter capacitor on the output of the rectifier, thus very little stored energy, which eliminates the need for a crowbar. As such, the DC output will have a ripple voltage of 10% p-p. This has the advantage of causing RF output amplitude and phase variation which facilitates mode stirring and potentially a more even heating of the process. System interlocks will remove the high voltage in less than 10 ms in the event of a fault. In addition, the klystron beam (high voltage) power supply is remotely located. This makes it possible to offer the VIS-102B in a corrosion resistant sealed stainless steel 2-bay enclosure. Cooling for the system is 100% via water; ambient air is not used for cooling purposes. A small flow of clean air is used to slightly pressurize the enclosure and keep potentially corrosive local ambient air from entering the inside of the enclosure.



VIS-102B

TECHNICAL CHARACTERISTICS

OUTPUT

CW Power Operation:	Adjustable to 60 kW, maximum. Continuous control range in excess of 27 dB.
Frequency:	2.45 GHz nominal. Tunable over plus or minus 5 MHz
Waveguide:	WR-430
Waveguide Arc Detector:	Standard. The Klystron window and the waveguide are protected by the control system, which will interrupt the RF drive power if arcs occur in the waveguide near the klystron.
Forward and Reflected Power Monitor:	A directional coupler at the klystron output is included. Excessive reflected power will also interrupt the RF drive power. A liquid-cooled, waveguide circulator capable of dissipating the full system power is available as an option.

TECHNICAL CHARACTERISTICS (Continued)

INPUT POWER

Voltage: 480 volts line-line, 4-wire (wire per phase plus ground), 60 Hz
Line Current: Approximately 165 Amp per phase at 60 KW microwave output power

COOLING

Clean water from an external source capable of 50 GPM at 60 PSIG, 10 to 40 degrees Centigrade.

SIZE AND WEIGHT

Weight: Approximately 2,500 pounds
Approximate Dimensions: 85 wide X 80 high X 40 deep
(maximum in inches)
Other Features: The unit has casters for ease of positioning at installation. The unit also has lifting eyes on the top surface for pick-up via an overhead crane. It is easily moved by fork lift or single pallet jack.

Characteristics, dimensions and operating values are based upon design calculations and performance tests. The information in this technical data sheet may change without notice as the result of additional data or product refinement. Beverly division of CPI should be consulted before using this information for final equipment design.

INSTRUMENTATION AND CONTROL

All operating, control, and data-collection functions are performed by the embedded controller. Critical interlocks, such as those required for system or personnel safety are hard-wired.

The control-center is a digital logic system that monitors and controls the performance of the microwave power system. All system parameters, such as beam current, beam voltage and magnet current are displayed through a web-browser on the monitor of a remote computer via an Ethernet connection. The embedded controller takes the required actions to match the microwave output power to the user's setpoint command (input via the browser) for power. In addition, other user controls of the system are provided. Complete access to the status of each analog and digital input and output is also remotely available to the user.

The embedded controller uses flash-memory to log the status of each of its inputs and outputs in a rolling file system that makes the last several days of operating available to the user. This data is stored in a format that will load directly into many spreadsheet programs for ease of data manipulation. These files may be e-mailed to CPI for assistance in troubleshooting and trend analysis should that be desired.

CABINETS

The system consists of 2 enclosures. The beam (high voltage) power supply may be remotely mounted from the main enclosure that houses the rest of the system. The main enclosure is a 2-bay stainless steel cabinet as shown on the first page. The larger left bay houses the embedded controller, distribution transformer, and several power supplies. The right bay houses the klystron, klystron driver, water cooling manifolds, other components, and output waveguide. Internal air circulating fans move air through air-water heat exchangers located in the partition between the 2 bays.

WAVEGUIDE SYSTEM

The components in the output waveguide system include a dual-directional coupler and an optical arc detector. Should an arc occur in the waveguide run, the arc detector circuitry will remove the RF drive power to the klystron in less than 10 microseconds after the arc is detected.

The dual-directional coupler provides a calibrated sample of both the RF power generated by the system and the RF power reflected back to the klystron. These samples are fed to the embedded controller where this information is used in process control as well as system protection.

System control will prevent damage to the klystron from the excessive reflected power by reducing or removing the RF drive to it. System control also shuts off the klystron beam power supply for a klystron arc-event.

The WR-430 waveguide is typically brought out through the top, right of the cabinet, but custom configurations are available.

CPI will assist with or execute most all aspects of system design, development and implementation, including such areas as process development, applicators, heat exchangers, waveguide transmission systems, and other factors required to assure a successful system.

For assistance, contact CPI Industrial Microwave Systems Application Engineering with your system requirements.
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