



Mini-HIPper® Hot Isostatic Presses

The HIP Process

Hot Isostatic Pressing (HIP) is a forming and densification process achieved through the application of heated high-pressure gas uniformly on all sides of an object. HIPping can virtually eliminate porosity, and is widely used to improve the properties and service life of a broad range of products and parts. It can be applied to both containerized powder shapes and preformed metal, ceramic or plastic components. Related functions include near net-shape forming, diffusion bonding of dissimilar materials, and the elimination of voids in castings.

The Mini-HIPper Line

Avure Autoclave Systems Mini-HIPpers are compact presses designed for HIP research and prototyping studies, and for small batch production runs. Most models are housed in a single, space-saving cabinet. On the two largest models (QIH-15L and QIH-21), the major subsystems are delivered as free-standing modules.

Capacities

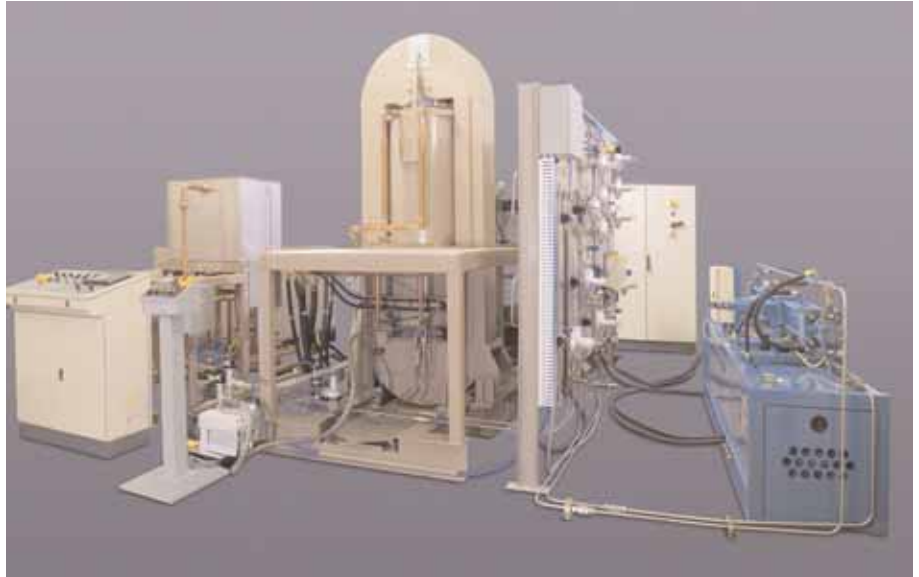
Work zone diameters range from 3" through 10", with heights from 5" through 30". The standard maximum operating pressure is 30,000 psi, with higher or lower pressures available. Standard temperatures range from ambient to 2000°C, with higher temperatures available for certain applications.

Operation

Parts to be HIPped are loaded into a cylindrical pressure vessel which contains a modular electric furnace. A thermal barrier is placed around the furnace to direct the heat load toward the parts and away from the water-cooled vessel wall. Argon or other gases are used as the pressure medium. Cycles are automatic, with a computer and PLC controlling independent ramping of pressure and temperature to setpoint, hold time, and decompression.

Designed for Safety

Mini-HIPpers feature the Quintus® pressure containment system, consisting of a forged pressure vessel with non-threaded upper and lower end closures, and a movable yoke frame which holds the end closures in place during the pressure cycle. Both the vessel and frame are pre-stressed and wire-wound to eliminate stress concentrations and tensile loads. The prestressing causes these components to remain in residual compression, even at maximum operating pressure, thus preventing crack propagation and brittle failure. The vessel meets "leak-rather-than-break" criteria, and has a calculated fatigue life of more than 15,000 cycles. This design is regarded as the safest in the world – after more than 40 years, there has never been a Quintus vessel failure.



Models QIH-15L and QIH-21



Models MIH-3, Q/MIH-9 and QIH-15

Furnaces

Users can select among several modular plug-in furnaces, depending on the temperature and atmospheric requirements of the application:

1. **Iron-chromium-aluminum (FeCrAl)** furnaces generate temperatures up to 1200°C, and are capable of operating in a concentration of up to 20% oxygen in a balance of argon. Typical applications include oxide ceramics for the electronics industry.

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2. **Molybdenum** furnaces, with temperatures to 1450°C, are suitable for applications requiring a clean environment, such as alloy metal densification.

3. **Graphite** furnaces are designed for use in argon and nitrogen up to 2000°C, and their high resistivity make them very well suited for vacuum operation, where low voltage is necessary. These furnaces are commonly used to strengthen and increase durability in non-oxide ceramic parts.

4. **Uniform Rapid Cooling.** Avure's patented URC, or quench furnace, is designed to circulate cooler gas throughout the work zone, and cuts total cooling time by 50 to 80 percent. The gas flow design cools all areas of the process parts uniformly, minimizing thermal distortion and grain growth. The URC furnace is offered in selected furnace materials and only for certain Mini-HIPper models (see table below).

Electronic Control

A computer control system is standard with all Avure Autoclave HIP systems. The IBM-compatible PC performs a total supervisory role, sending user-programma-

ble pressure and temperature setpoints to the PLC, initiating and terminating the pressure cycle, logging data onto a disk and printer, storing cycles under specific names, and displaying all current system conditions on the monitor.

System Components

The Avure Autoclave Systems Mini-HIPper is delivered complete with Quintus pressure vessel and yoke frame, choice of electric furnace, electrohydraulic compressor, vacuum pump, pressure valve system, closed loop vessel cooling system, and computer control system with software and PLC.

Options

Consult factory for availability on specific models.

1. HIP dilatometer
2. Additional transducer for low pressure
3. Higher capacity vacuum pump
4. Higher capacity compressor

Standard Models

Model Number	Work Zone Dimensions (I.D. x Height)				System Dimensions						Approximate Total Weight
	FeCrAl	Molybdenum	Graphite	Uniform Rapid Cooling	Subsystem Width	Cabinet Depth	Height	Vessel Width	Frame Depth	Assembly Height	
MIH-3	2.9 x 4.9" 75 x 125mm	4 x 5" 102 x 127mm	3.75 x 5.9" 95 x 150mm	Not Available	56"	48"	48"	Included in cabinet			3,500 lbs. 1,588 kg
QIH-9	6 x 12" 152 x 305mm	6 x 12" 152 x 305mm	6 x 12" 152 x 305mm	Available	85"	51"	61"	Included in cabinet			4,560 lbs. 2,068 kg
QIH-15	8 x 12" 203 x 305mm	8 x 12" 203 x 305mm	8 x 12" 203 x 305mm	Not Available	95"	54"	73"	Included in cabinet			4,841 lbs. 2,318 kg
QIH-15L	8 x 19.6" 203 x 500mm	8 x 19.6" 203 x 500mm	8 x 19.6" 203 x 500mm	Not Available	55" *	95" *	53" *	52"	150"	84"	7,875 lbs. 3,580 kg
QIH-21	9.9 x 30" 252 x 762mm	9.9 x 30" 252 x 762mm	9.9 x 30" 252 x 762mm	Available	Free-standing modules			96"	156"	110"	13,400 lbs. 6,080 kg
								2438mm	3962mm	2794mm	

* QIH-15L cabinet includes cooling and electrical subsystems only.
Press and compressor are separate modules.

Contact factory for CE, PED, and other national code requirements.
ASME code stamping available as an option.



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Quality System Certified

