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BRIDGMAN CRYSTAL GROWTH FURNACE

BV-HTRV

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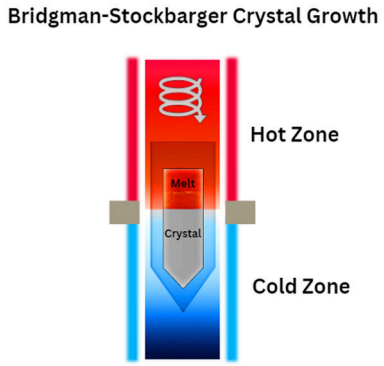
BV-HTRV

BRIDGMAN CRYSTAL GROWTH FURNACE

The BV-HTRV is as a special crystal growing furnace according to the Bridgman method.

The Bridgman method uses a pre-synthesized material that moves slowly through a temperature gradient. The melted material moves through a decreasing temperature gradient and forms a single crystal. The BV-HTRV is a tube furnace which is mounted on a device engineered specifically for the Bridgman method. As a standard, the HTRV 70-250 or the HTRV 100-250 are used as a tube furnace mounted on the pulling device. In principal, every tube furnace can be mounted on the pulling device.



Crystal growing process with the Bridgman-Stockbarger method.

The short heated length is an advantage as it creates an ideal gradient for the Bridgman method. The temperature decreases towards the bottom of the furnace. The pulling device moves the sample with an adjustable speed toward the lower temperature. Next to the sample is a thermocouple in order for an accurate reading of the sample temperature. Both, sample and probe thermocouple are attached to the bottom pulling device. The movement of the sample can be fast for loading and unloading or with a user defined speed for crystal growth.

A ceramic tube surrounds the probe thermocouple and sample. At both ends of the tube, a water cooled flange is connected. At the top of the system, the tube and flange are fixed. A bellow connects the tube and pulling device at the bottom of the furnace. The bellow is extended during the downward movement of the sample. Operation of the unit can be achieved under vacuum conditions.

At the top, the tube is connected to the vacuum pump. The valve towards the vacuum line is opened and closed manually. The vacuum level is controlled by a piezo measurement gauge. A manually operated rotameter allows purging of inert gas. To reduce the Oxygen value prior to the crystal growing process, evacuation and backflooding with an inert gas is performed several times.

It is possible to connect a computer to the system in order to log all the relevant data of the process, i. e. position of the sample and temperature of the probe thermocouple. To load and unload the sample, the clamps must be opened. With the fast moving option, the sample is easily accessible.

The pulling device that enables Bridgman type crystal growth can be combined with all single and multi-zone tube furnaces.

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ADVANTAGES

- Bridgman method - Crystal growing
- In vacuum up to 1450 °C
- In an inert atmosphere up to 1800 °C
- Precisely defined and controlled pulling speed
- Manual operation
- Data recording option

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OPTIONS

Depending on the requirements, several options are available for both software and hardware configurations.

- Over-temperature protection with Eurotherm controller
- Rotary vane pump
- High vacuum pump unit
- Chiller, if no cooling water is available
- Additional gas inlet with valve and rotameter
- Probe thermocouple, located next to the sample

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SOFTWARE

Manual furnaces are operated by Eurotherm controllers in combination with a KP 300 Panel. Valves and pumps are operated by simple push buttons on the panel. For data logging purposes, iTools software and PC connectivity are available.

- Eurotherm 3508: 10 different storable programs with 500 different segments
- Eurotherm 3508: 50 different storable programs with 500 different segments
- RS 232/485
- iTools OPTION
- Over-temperature protection option (recommended for continuous and unattended use)
- Remote control

Standard Brigman furnace up to 1800°C

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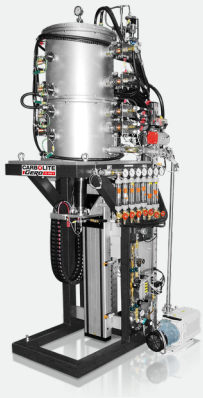
APPLICATION EXAMPLES

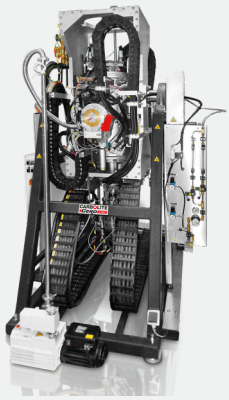
BV-HTRV-250/18: Bridgman furnace with 250 mm heated length up to 1800°C; equipped with a pre-vacuum pump

Bridgman furnace up to 2200°C with InGa-bath



Brigdman furnace up to 2200°C under high vacuum (custom designed)

Standard Brigman furnace up to 1800°C



Bridgman furnace up to 1600°C with adjustable angle (custom designed)

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TECHNICAL DATA

The Bridgman Crystal Growth Furnace includes heating elements of MoSi2 that are mounted in a vertical, hanging position and are surrounded by vacuum formed plates to insulate the heat from the housing. The housing is slotted to enable convection cooling of the casing. Depending on the melting point of the sample, the maximum temperature is designed up to 1600 °C, 1700 °C, or 1800 °C. For the pulling device, two motors with different transmission ratios are implemented. For instance, the fast moving of the samples is possible with a speed of approximately 10 mm/s, whereas the Bridgman crystal growing process, the pulling speed is only 0.00001 mm/s (10 nm/s).

All connecting tubes of the lower water cooled flange are inserted in a drag chain. The control thermocouple is a type B thermocouple. An overtemperature thermocouple is optional and highly recommended as unattended operation is likely due to the long time period needed for the crystal growing process.

If temperatures of more than 1800 °C are required for Bridgman crystal growing processes, Carbolite offers custom designed solutions. Please contact us for a free consultation - we are glad to help.

	BV-HTRV 70-250	BV-HTRV 100-250
Tmax (°C)	1600, 1700, 1800	1600, 1700, 1800
Max. outer diameter accessory tube (mm)	70	100
Heated length (mm)	250	250
Furnace dimensions H x W x D (mm)	1800 x 950 x 750	1800 x 950 x 750
Furnace weight (kg)	300	300
Control module dimensions H x W x D (mm)	850 x 560 x 600	850 x 560 x 600
Control module weight (kg)	60	60
Power (kW)	5	6.5

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