TOP HAT FURNACE - HBO

The metallic hood furnaces (HBO) generate the lowest achievable operation pressures. The highest purity gas atmosphere is attained due to the vacuum capability.

The materials used in the construction are selected for the lowest vapour pressures at the highest temperatures. Heat treatment up to the highest temperatures can be achieved without harming the heating elements or insulation material. Radiation shields are used to provide thermal insulation, which are made from the same material as the heating elements, and no fibrous thermal insulation is used.

Two varieties of HBO furnaces are produced: those made using molybdenum heating elements and radiation shields are suitable for use up to 1600 °C; those made using tungsten heating elements and radiation shields are suitable for use up to 2200 °C.

Nitrogen, Argon, and Hydrogen gases are available for use in mixed or pure forms. Additional gases can be installed upon request. A slight overpressure or controlled partial pressure between 10 and 1000 mbar can be achieved. Partial pressure provides a defined gas flow through the furnace.

Due to the complete metallic design, the final vacuum level in the HBO can reach the high vacuum range and better than 5×10^{-6} mbar. Depending on the vacuum requirements, the vacuum is provided by different pumping stations. Ultrahigh vacuum options are available upon request. Gases are controlled by various dosing and controlling devices. The temperature in each of the three heating zones is individually controlled to maintain the best uniformity.

APPLICATION EXAMPLES

annealing, brazing, carbonization, ceramic injection moulding (CIM), debinding, degassing, drying, hardening, metal injection moulding (MIM), pyrolysis, quenching, rapid prototyping, siliconization, sintering, soldering, sublimation, synthesis, tempering

STANDARD FEATURES

- Precisely defined atmosphere with highest possible purity (6 N or better)
- Best possible vacuum
- Fast heat up and cool down upon request
- Hydrogen partial pressure operation upon request
- Precisely controlled vacuum pumping speeds appropriate for powders
- Certified safety management for flammable and toxic gases
- Fully automatic operation
- Data recording for quality management

OPTIONS (*SPECIFY THESE AT TIME OF ORDER*)

- Vacuum system for pre-vacuum, fine vacuum or high vacuum operation
- Software for automated operation, data tracking and data export

- Reaction gas equipment for more than one inert gas, retorts, afterburners
- Water cooling system

TECHNICAL DETAILS

View inside of the HBO Hood Furnace

1. gas inlet or outlet
2. gas outlet or inlet
3. pumping unit attached from below
4. location of the thermocouple
5. radiation shields
6. heating elements
7. water cooled vessel
8. sample holder (built on request)

The HBO Hood Furnace is constructed of metallic materials only with a total of 9 radiation shields. It has three heating zones to improve the temperature uniformity over the whole length and also to enable preheating of the incoming gas if required. The three heating zones consist of the mantle, top and bottom heater. The mantle heater is designed for the highest mechanical stability. An optional metallic retort can be specified to protect the heating elements should any outgassing of the sample occur and improve the temperature uniformity.

To insulate the heat in metallic furnaces, tungsten or molybdenum radiation shields are used. The HBO has a double walled, water cooled vessel. The sample holder is positioned as required.

Each of the three heating zones are individually controlled and protected by an additional over-temperature protection thermocouple; therefore, unattended operation is possible. An optional fast cooling system significantly reduces the cool down time.

View inside HBO

TECHNICAL DETAILS (MODELS)

	HBO 10 MO/16-1G	HBO 25 MO/16-1G	HBO 60 MO/16-1G
Insulation material	Molybdenum	Molybdenum	Molybdenum
Dimensions: External H x W x D (mm)	2500 x 2300 x 2000	2500 x 2300 x 2000	2800 x 2300 x 2500
Transport weight (kg)	1800	2000	3000
Usable space			
Volume (l)	10	25	60
Ø x H, usable space without retort (mm)	200 x 300	300 x 400	400 x 500
Ø x H, usable space with retort (mm)	180 x 280	280 x 380	380 x 480
Thermal values			
Tmax vacuum (°C)	1600	1600	1600
Tmax atmospheric pressure (°C)	1600	1600	1600
-Delta-T, above 800°C (K) according to DIN 17052	± 10	± 10	± 10
Max. heat-up rate (K/min)	10	10	10
Cooling time (h)	3	4	5
Connecting values			
Power (kW)	50	65	80
Voltage (V)	400 (3P)	400 (3P)	400 (3P)
Current (A)	3 x 125	3 x 100	3 x 120
Series fuse (A)	3 x 160	3 x 125	3 x 160
Vacuum (option)			
Leakage rate - clean, cold and empty (mbar l/s)	< 5x10-3	< 5x10-3	< 5x10-3
Vacuum range depending on the pumping unit	rough, fine, high or ultra high vacuum	rough, fine, high or ultra high vacuum	rough, fine, high or ultra high vacuum
Cooling water required			

	HBO 10 MO/16-1G	HBO 25 MO/16-1G	HBO 60 MO/16-1G
Flow (l/min)	40	50	64
Gas supply			
Nitrogen or Argon flow, others on request (l/h)	500-2000	500-2000	500-2000
Controller	Siemens	Siemens	Siemens

	HBO 10 W/22-1G	HBO 25 W/22-1G	HBO 60 W/22-1G
Insulation material	Tungsten	Tungsten	Tungsten
Dimensions: External H x W x D (mm)	2500 x 2300 x 2000	2500 x 2300 x 2000	2800 x 2300 x 2500
Transport weight (kg)	1800	2000	3000
Usable space			
Volume (l)	10	25	60
Ø x H, usable space without retort (mm)	200 x 300	300 x 400	400 x 500
Ø x H, usable space with retort (mm)	180 x 280	280 x 380	380 x 480
Thermal values			
Tmax vacuum (°C)	2200	2200	2200
Tmax atmospheric pressure (°C)	2200	2200	2200
-Delta-T, above 800°C (K) according to DIN 17052	± 10	± 10	± 10
Max. heat-up rate (K/min)	10	10	10
Cooling time (h)	4	5	6
Connecting values			
Power (kW)	125	150	250
Voltage (V)	400 (3P)	400 (3P)	400 (3P)
Current (A)	3 x 180	3 x 220	3 x 380
Series fuse (A)	3 x 250	3 x 315	3 x 500
Vacuum (option)			
Leakage rate - clean, cold and empty (mbar l/s)	< 5x10-3	< 5x10-3	< 5x10-3
Vacuum range depending on the pumping unit	rough, fine, high or ultra high vacuum	rough, fine, high or ultra high vacuum	rough, fine, high or ultra high vacuum
Cooling water required			
Flow (l/min)	100	120	200
Gas supply			

	HBO 10 W/22-1G	HBO 25 W/22-1G	HBO 60 W/22-1G
Nitrogen or Argon flow, others on request (l/h)	500-2000	500-2000	500-2000
Controller	Siemens	Siemens	Siemens

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