

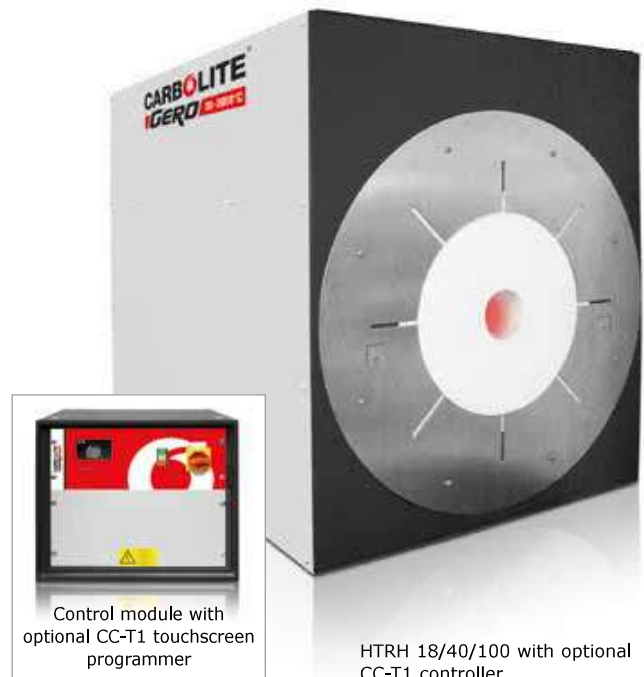
## HTRH – High Temperature Horizontal Tube Furnaces

**The Carbolite Gero high temperature tube furnaces HTRH can be used horizontally up to 1800°C.**

The high-grade insulation materials guarantee low energy consumption and high heating rates due to their low thermal conductivity. The insulation and molybdenum disilicide ( $\text{MoSi}_2$ ) heating elements are installed in the rectangular housing. The heating elements are vertically hanging (see 'view inside' figure) and can be replaced easily. At higher temperatures and in the presence of oxygen,  $\text{MoSi}_2$  develops an oxide ( $\text{SiO}_2$ ) layer, which protects the heating elements against further thermal or chemical corrosion.

### Standard features

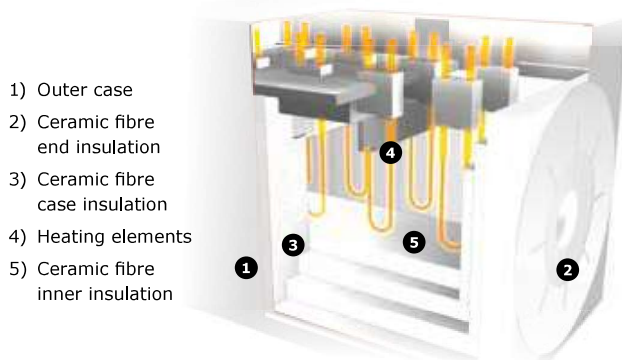
- 1800°C maximum operating temperature
- Programmable 3216P1 controller
- 3-zone models fitted with 1 x programmable 3216P1 and 2 x 3216CC end zone controllers, with retransmission of setpoint
- Over-temperature protection
- Accepts work tubes with outer diameters up to 100 mm for use with modified atmosphere
- Accepts work tubes with outer diameters up to 200 mm for use in air
- Heated lengths of 100, 250, 300 or 600 mm
- High grade thermocouple type B
- Low thermal mass ceramic fibre insulation
- High quality  $\text{MoSi}_2$  heating elements in a vertical, hanging position
- Rectangular housing with holes for convection cooling
- Available with 1–3 heating zones
- Furnace comes with separate control box with 3 m cable, plug and socket



### Options (specify these at time of order)

- A range of sophisticated digital controllers, multi-segment programmers and data loggers is available. These can be fitted with RS232, RS485 or Ethernet communications (see pages 106–111). Please note that special controllers may be needed for this model
- A range of additional work tubes is available in a variety of materials (see page 113)
- Insulation plugs & radiation shields are strongly recommended for high temperature vertical tube furnaces to prevent heat loss & improve uniformity (see page 117)
- Modified atmosphere and vacuum assemblies are available (see page 117)
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available (page 118)
- Oxygen sensor for inert gas packages

### View inside



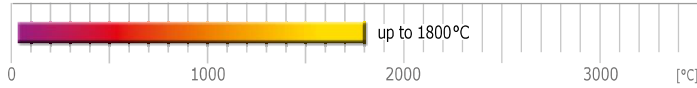
- 1) Outer case
- 2) Ceramic fibre end insulation
- 3) Ceramic fibre case insulation
- 4) Heating elements
- 5) Ceramic fibre inner insulation

### HTRH-3 furnace with three heating zones

**Better temperature uniformity can be achieved by dividing the heated length into 3-zones.**

Each zone is equipped with a dedicated thermocouple and controller, which is especially useful to preheat gases required for reactions inside the system.

The HTRH tube furnaces do not include an integral work tube. The work tube must be selected as an additional item. The work tube length is dependent on the application and will vary if used with or without modified atmosphere or vacuum.



## HTRH – High Temperature Horizontal Tube Furnaces



Horizontal High Temperature Tube Furnace HTRH 18/70/600 with optional 3508P1 programmer and optional high vacuum capable inert gas package (high vacuum capable up to 1450°C and up to 1800°C under normal pressure. Rotary vane pumps and turbo pumps optional available (see page 118).

### Technical data

Model	Max. temperature [°C]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length		Dimensions: External H x W x D [mm]	Furnace weight [kg]	Dimensions: Control module H x W x D* [mm]	Control module weight [kg]	Uniform length ± 5°C [mm]	Max. power [W]
				for use in air [mm]	for use with modified atmosphere [mm]						

#### Single Zone High Temperature Horizontal Tube Furnaces HTRH

HTRH ___/40/100	1600	40	100	380	915	510 x 390 x 420	45	480 x 560 x 500	50	50	2200
HTRH ___/40/250	1600, 1700, 1800	40	250	530	1065	510 x 540 x 420	45	480 x 560 x 500	50	125	3600
HTRH ___/40/500	1600, 1700, 1800	40	500	780	1275	510 x 790 x 420	60	850 x 560 x 500	90	250	8000
HTRH ___/70/150	1600, 1700	70	150	440	975	620 x 450 x 520	65	480 x 560 x 500	60	75	4500
HTRH ___/70/300	1600, 1700, 1800	70	300	580	1115	620 x 590 x 520	65	850 x 560 x 500	60	150	6400
HTRH ___/70/600	1600, 1700, 1800	70	600	880	1415	620 x 890 x 520	90	850 x 560 x 500	90	300	8000
HTRH ___/100/150	1600	100	150	440	975	620 x 450 x 520	75	480 x 560 x 500	60	75	4800
HTRH ___/100/300	1600, 1700, 1800	100	300	580	1115	620 x 590 x 520	90	850 x 560 x 500	90	150	7500
HTRH ___/100/600	1600, 1700, 1800	100	600	880	1415	620 x 890 x 520	120	850 x 560 x 500	90	300	10900
HTRH ___/150/600	1600, 1700, 1800	150	600	880	Not available	670 x 890 x 570	140	850 x 560 x 500	90		12000
HTRH ___/200/600	1600, 1700, 1800	200	600	880	Not available	720 x 890 x 620	180	850 x 560 x 500	90		12000

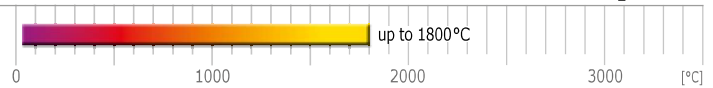
#### 3-Zone High Temperature Horizontal Tube Furnaces HTRH

HTRH-3 ___/70/600	1600, 1700, 1800	70	600	880	1415	620 x 890 x 520	120	850 x 560 x 500	180	350	8000
HTRH-3 ___/100/600	1600, 1700, 1800	100	600	880	1415	620 x 890 x 520	120	850 x 560 x 500	180	350	10900
HTRH-3 ___/100/900	1600, 1700, 1800	100	900	1180	1715	680 x 1190 x 650	250	1100 x 1200 x 700	230		20000
HTRH-3 ___/150/600	1600, 1700, 1800	150	600	880	Not available	670 x 890 x 570	180	850 x 560 x 500	180		12000
HTRH-3 ___/150/900	1600, 1700, 1800	150	900	1180	Not available	680 x 1190 x 650	250	1100 x 1200 x 700	230		20000

**i** Please note:

- Heat up rate when using an optional ceramic work tube must be limited to 5°C/min
- The power supply is based on 200–240 V for 1 phase and 380–415 V for 3 phase power
- Minimum uniform length in horizontal furnace with insulation plugs fitted at 100°C below max. temperature

- Maximum continuous operating temperature is 100°C below maximum temperature
- \* Further to the depth of the control module 150 mm for the power plugs and other plugs needs to be added



## HTRV – High Temperature Vertical Tube Furnaces

**The HTRV high temperature tube furnaces are designed for vertical orientation and operation up to 1800 °C.**

The high grade insulation material consisting of fibre plates provide low energy consumption and high heating rates due to their low thermal conductivity. The insulation and the molybdenum disilicide ( $\text{MoSi}_2$ ) heating elements are installed in a rectangular housing. The heating elements hang vertically and can be easily replaced. At higher temperatures and in the presence of oxygen,  $\text{MoSi}_2$  develops an oxide layer which protects the heating elements against further thermal or chemical corrosion.

With its wide range of accessories, the comprehensive HTRV range provides complete system solutions for ambitious thermal treatment at high temperatures.

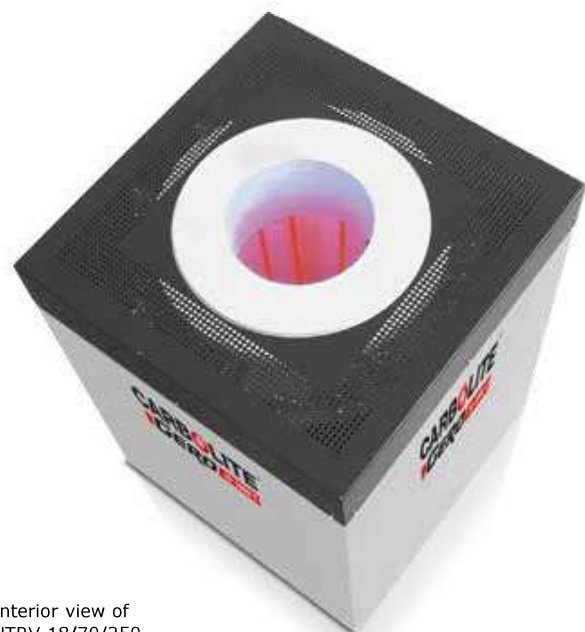
Furnaces are supplied without a stand, allowing customers to build them into their own equipment. Optional 'L' stands are available allowing the furnaces to be self supporting.



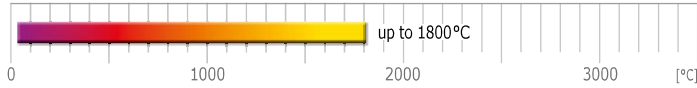
HTRV 18/70/250 with optional CC-T1 controller, optional 'L' stand, optional voltage/current display and optional high vacuum/inert gas package (high vacuum possible up to 1450 °C). Rotary vane and turbomolecular pumps available as options.

### Standard features

- 1800 °C maximum operating temperature
- Programmable 3216P1 controller
- Over-temperature protection
- Optimized for vertical usage
- Accepts work tubes with outer diameters up to 100 mm for use with modified atmosphere
- Accepts work tubes with outer diameters up to 200 mm for use in air
- Heated lengths of 100, 250 or 500 mm
- High grade type B thermocouple
- Low thermal mass ceramic fibre insulation
- Vertically hanging high quality  $\text{MoSi}_2$  elements
- Rectangular housing with holes for convection cooling
- Furnace comes with separate control box with 3 m cable, plug and socket



Interior view of HTRV 18/70/250 at high temperature



## HTRV – High Temperature Vertical Tube Furnaces

### Options (specify these at time of order)

- A range of sophisticated digital controllers, multi-segment programmers and data loggers is available. These can be fitted with RS232, RS485 or Ethernet communications (see pages 106 – 111). Please note that special controllers may be needed for this model
- A range of additional work tubes is available in a variety of materials (see page 113)
- Insulation plugs & radiation shields are strongly recommended for high temperature vertical tube furnaces to prevent heat loss & improve uniformity (see page 117)
- Modified atmosphere and vacuum packages are available (see page 117)
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available (page 118)
- 'L' stand for convenient usage
- Oxygen sensor for inert gas packages



HTRV 17/150/250 with optional L-Stand, current / voltage display and recommended fibre insulation plugs

## Technical data

CGN	Max. temperature [°C]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length		Dimensions: External H x W x D [mm]	Furnace weight [kg]	Dimensions: Control module H x W x D* [mm]	Control module weight [kg]	Uniform length ± 5°C [mm]	Max. power [W]
				for use in air [mm]	for use with modified atmosphere [mm]						

### High Temperature Vertical Tube Furnaces HTRV

HTRV ___/40/100	1600, 1700	40	100	355	890	365 x 455 x 455	30	480 x 560 x 500	50	50	2000
HTRV ___/40/250	1600, 1700, 1800	40	250	505	1040	515 x 455 x 455	40	480 x 560 x 500	50	125	3000
HTRV ___/40/500	1600, 1700	40	500	755	1290	765 x 455 x 455	65	850 x 560 x 500	60	250	6000
HTRV ___/70/100	1600, 1700	70	100	355	890	365 x 455 x 455	30	480 x 560 x 500	50	50	3000
HTRV ___/70/250	1600, 1700, 1800	70	250	505	1040	515 x 455 x 455	40	850 x 560 x 500	60	125	4800
HTRV ___/70/500	1600, 1700, 1800	70	500	755	1290	765 x 455 x 455	65	850 x 560 x 500	90	250	8000
HTRV ___/100/250	1600, 1700, 1800	100	250	505	1040	515 x 455 x 455	45	850 x 560 x 500	60	125	7000
HTRV ___/100/500	1600, 1700, 1800	100	500	755	1290	765 x 455 x 455	70	850 x 560 x 500	90	250	10400
HTRV ___/150/250	1600, 1700, 1800	150	250	505	Not available	515 x 580 x 580	55	850 x 560 x 500	90		8000
HTRV ___/150/500	1600, 1700, 1800	150	500	755	Not available	765 x 580 x 580	80	850 x 560 x 500	90		12000
HTRV ___/200/250	1600, 1700, 1800	200	250	505	Not available	515 x 580 x 580	70	850 x 560 x 500	90		10000
HTRV ___/200/500	1600, 1700, 1800	200	500	755	Not available	365 x 580 x 580	95	850 x 560 x 500	90		14000

**i** Please note:

- Heat up rate when using an optional ceramic work tube must be limited to 5°C/min
- The power supply is based on 200–240 V for 1 phase and 380–415 V for 3 phase power
- Minimum uniform length in horizontal furnace with insulation plugs fitted at 100°C below max. temperature

- Maximum continuous operating temperature is 100°C below maximum temperature
- \* Further to the depth of the control module 150 mm for the power plugs and other plugs needs to be added