CARBOLITE GERO 30-3000°C

Laboratory Tube Furnaces

LEADING HEAT TECHNOLOGY

part of VERDER scientific

VERDER scientific

CARBOLITE GERO 30-3000°C

ELTRA

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QATM

MICROTRAC MRB

SCIENCE FOR SOLIDS

HEAT TREATMENT
ELEMENTAL ANALYSIS
MATERIALOGRAPHY &
HARDNESS TESTING
MILLING & SIEVING
PARTICLE CHARACTERIZATION

As part of the VERDER Group, the business division VERDER SCIENTIFIC sets standards in the development, manufacture and sales of laboratory and analytical equipment.
The instruments are used in the areas of quality control, research and development for sample preparation and analysis of solids.

www.verder-scientific.com

Leading Heat Technology

The Carbolite Gero brand is synonymous with high quality, leading heat technology in the design and manufacture of laboratory and industrial ovens and furnaces ranging from 30 °C to 3000 °C and sold globally to over 100 countries.

On 1st January 2016 Carbolite (UK) and Carbolite Gero (Germany) joined to become one company under the name of Carbolite Gero. With the combined product lines the company will strengthen its market position locally and globally. In the past, both companies gained strong, established reputations for engineering expertise in applied heating technology.

Carbolite Gero has two manufacturing and sales sites. One is based in Derbyshire, United Kingdom, where Carbolite has been manufacturing laboratory and industrial ovens and furnaces up to 1800 °C since 1938; the second facility is located in Neuhausen, southern Germany, where high temperature furnaces up to 3000 °C with a large variety of solutions for vacuum and other modified atmospheres have been manufactured since 1982.

In addition to the wide range of standard products as shown in this catalogue, Carbolite Gero is an expert in the development of customized equipment for complex heat treatment processes. Solving customers' individual application requirements has given Carbolite Gero an important place in aerospace, engineering, materials science, heat treatment, medical, bioscience and contract testing laboratories globally to name a few. Not only can Carbolite Gero supply products with Standards-compliant furnace and oven designs (eg, Nadcap heat treatment processes (AMS2750E)), but also fully traceable certification for control, measurement, recording and data acquisition devices, issued by an independent UKAS accredited laboratory.

All products, and more, featured in this catalogue are available through your local Carbolite Gero office or an extensive network of dealers and local sales organisations.

www.carbolite-gero.com

Content

Disclaimer

As Carbolite Gero has a policy of continuous product development, improvements and changes will be made during the lifetime of this catalogue. Carbolite Gero reserves the right to amend the specifications at any time and in any particular way without prior notice provided that the ultimate performance of the equipment is not reduced by such action.

If the dimensions or technical specification of a product in this catalogue are critical, it is important that Carbolite Gero is contacted to confirm the details prior to order placement.

TF1 11/32/150 Mini

TS1 12/125/600 Medium


FHA 13/80/500

TF1 16/100/450 Medium


HTRV-A 17/100/700


HTRV 18/70/250

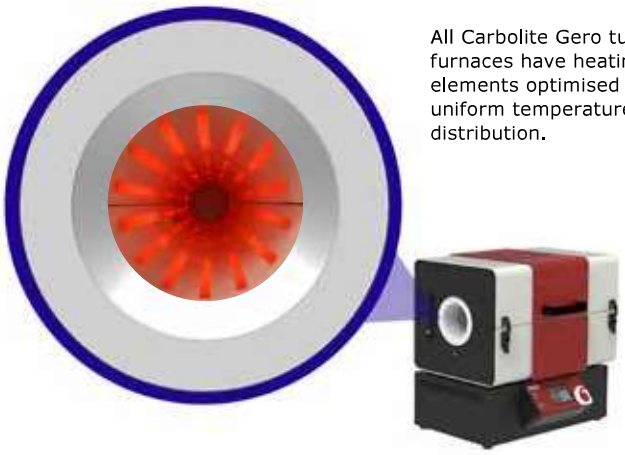

RHZS 11/75/900

HTR 11/150

With over 8 decades experience manufacturing universal and split-tube furnaces, Carbolite Gero is a global leader in the demanding area of temperature uniformity. A tube furnace is often selected as the most economical method of heating a small sample. Our latest power efficient tube furnace design significantly reduces the overall power consumption used in every cycle helping to improve your initial Return on Investment and ensuring you minimise your electricity costs.

Tube furnaces enable rapid temperature changes on the sample. They are available with single, three zone or gradient heating capabilities and can be configured with an inert atmosphere or a vacuum. Whatever your specific requirement we have a range of solutions that are highly configurable.

Carbolite Gero's design features optimised uniform zone



All Carbolite Gero tube furnaces have heating elements optimised for uniform temperature distribution.

The selection of a tube furnace should take into account the following factors:

What temperature?

- It is recommended to allow at least 100 °C extra heating range above the desired working temperature
- Standard models are available with maximum operating temperatures from 1100 °C to 1800 °C

Single or 3-zone?

- Tube furnaces provide a high level of uniformity which may be required for applications that require a specific temperature uniformity (see image top right showing typical optimised uniform length).
- The length of the central uniform zone can be further increased by adding heated zones at the ends in the form of a 3-zone furnace design
- For temperature gradients see page 30

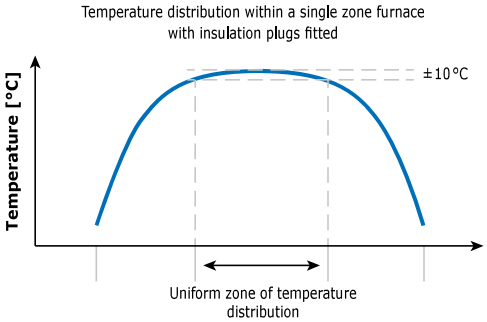
Size & work tubes?

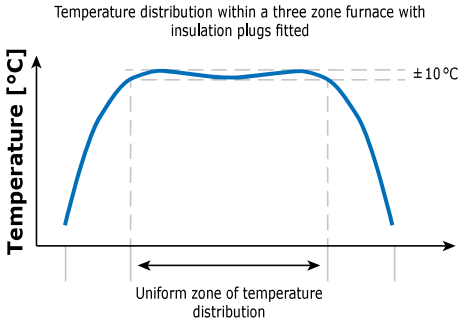
- An accessory work tube is essential for tube furnaces
- To ensure the material properties are appropriate for the users application, accessory work tubes are available in a range of materials (see page 41)
- See the 'work tube package' section pages 42 – 43 for details of the available work tube package.

Modified atmosphere or vacuum?

- Tube furnaces are ideal when the sample must be heated in an inert atmosphere or a vacuum
- Work tube packages for use with gas atmosphere and vacuum are available (pages 42 – 43)
- A choice of rotary vane or turbomolecular vacuum pump packages is available (see page 46)

Temperature Uniformity Comparison





Mounting Configurations

The Carbolite Gero TF, TS & TG tube furnaces are supplied in a horizontal configuration as standard.

The Carbolite Gero FHA, FHC, HTRH, HTRH-3, FST, FZS tube furnaces are supplied in a horizontal configuration as standard. The HTRH and HTRH-3 furnaces can not be tilted.

The Carbolite Gero HTRV and HTRV-A tube furnaces are supplied in a vertical configuration as standard and can not be tilted.

Furnace body on top of control box

The following models have the furnace body mounted on top of the control box:

- TF mini;
- TF & TS small;
- TF & TS medium up to and including 600 mm heated length;
- TF 1600°C;
- TG small and medium.

The furnace body can be easily dismounted from the control box. The 2 m long interconnection cables that connect the furnace body to the control box can be easily unplugged.

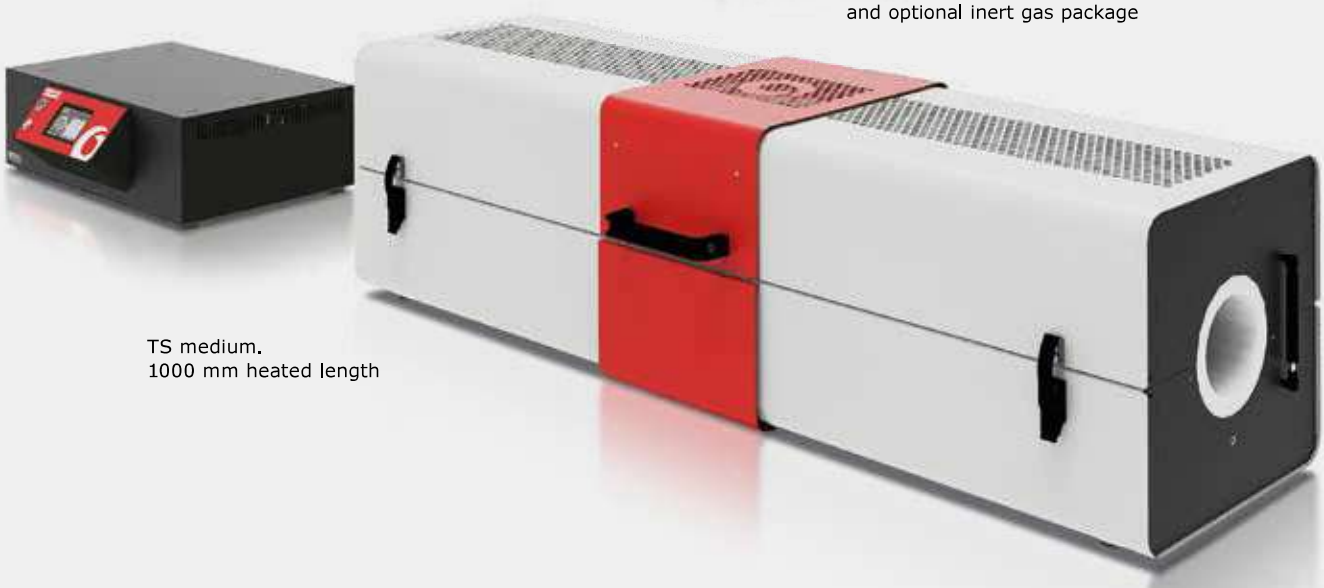
TS small. Furnace body can be dismounted from the control box

Furnace body and separate control box

The following models have a separate control box:

- TF & TS medium 800 mm heated length and above;
- TS large.
- FHA, FHC, FST & FZS
- HTRH & HTRH-3
- HTRV & HTRV-A

FHA 13/80/500 with optional CC-T1 controller and optional inert gas package



TS medium.
1000 mm heated length

Vertical packages

Optional 'vertical packages' can be ordered to mount the furnace body in a vertical orientation.

L-stands available for vertical use for FHA, FHC, FST, FZS tube furnaces.

Stands available for HTRV and HTRV-A tube furnaces as sole option and are part of inert gas packages with long work tube.

TS range with vertical stand package
This includes the vertical tube support components

FHA, FHC, FST, FZS range with L-stand

HTRV range with stand
and optional inert gas package

The base of the TS, TF & TG vertical stand package can be removed. The vertical frame can be used to mount the furnace to other equipment.

The vertical tube support package for TF, TS & TG without stand or mounting bracket is also available

Interconnect cables

TF, TS & TG

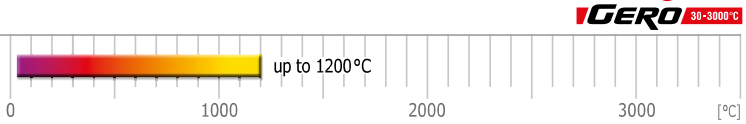
The interconnection cables are 2 m long and can be easily unplugged. Optional 4 m extension leads are available to give a total of 6 m interconnection cable.

FHA, FHC, FST & FZS

HTRH & HTRH-3

HTRV & HTRV-A

The interconnection cables are 3 m long and can be easily unplugged. Optional 6 m long interconnection cables are available.



TF1, TF3 Tube Furnaces

With maximum temperatures ranging from 1100 °C and 1200 °C, the TF tube furnace range incorporates high-quality heating elements and innovative thermal insulation design to achieve first class performance delivering both reduced case temperatures and power consumption.

TF1 11/32/150 with CC-T1 temperature programmer

Standard features

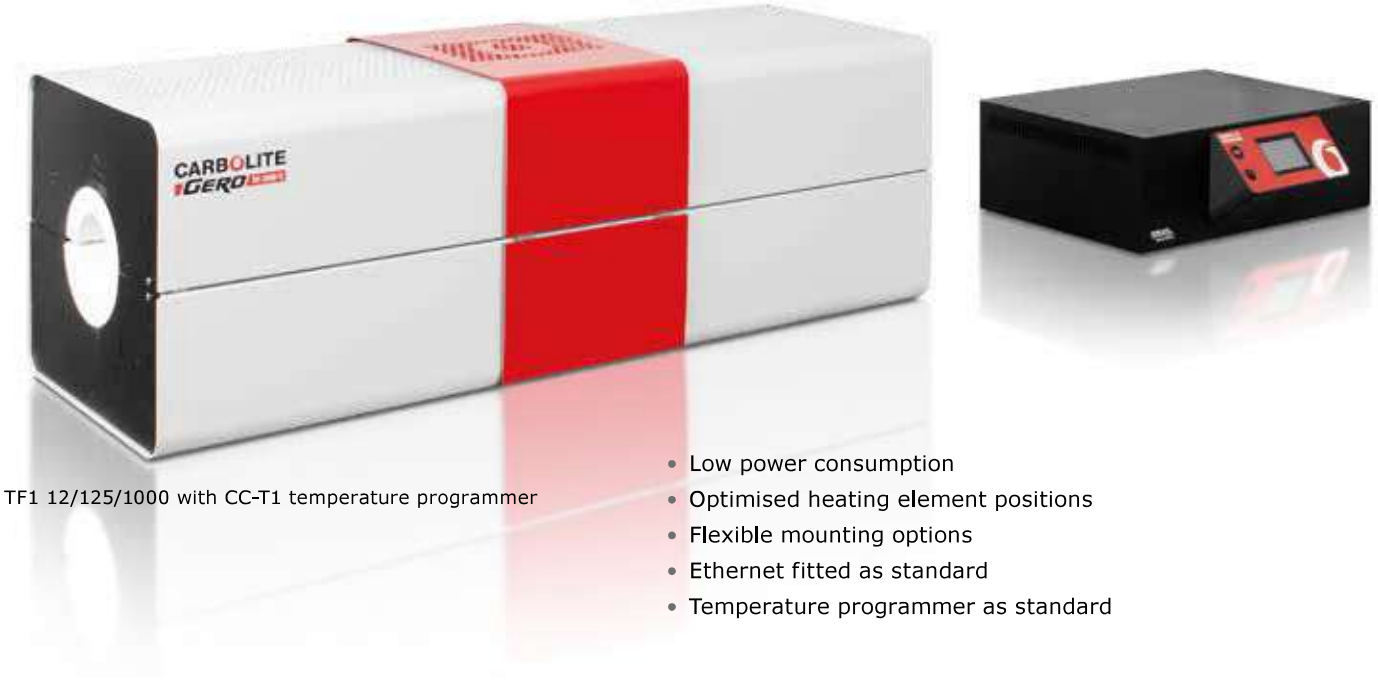
- 1100 °C & 1200 °C maximum operating temperatures
- Programmable temperature controller with 24 segments.
  - TF1 fitted with Carbolite Gero EPC3016P1
  - TF3 fitted with Carbolite Gero CC-T1
- Ethernet Communications
- TF1 (1-zone) Heated length range from 150 to 1200 mm
- TF3 (3-zone) Heated length range from 450 to 1200 mm
- Accepts work tubes with outer diameters from 32 mm up to 125 mm
- Wire elements in high quality vacuum formed insulation ensure fast heat up, excellent temperature uniformity and short cool down times
- Horizontal configuration mounted on control module for heated lengths up to 600 mm
- Furnace body detachable from the control box to allow use of optional mounting arrangements (see pages 6 – 7)
- Horizontal configuration have a separate control module for heated lengths of 800 mm and above
- Control module with 2 metre cable to furnace with plug and socket

The extensive range features three main case sizes, mini, small, and medium, with multiple heated lengths available. Standard models can be configured to function with a single heated zone (TF1) or three heated zones (TF3) to extend the uniform heated length. Each heated zone of the TF3 benefits from its own dedicated controller and thermocouple.

A slide-in accessory work tube is required to protect the heating elements and support the work piece. The TF range can accommodate work tubes with outside diameters of 32 mm to 125 mm.

The variety of available work tubes and the use of tube adapters allow a single furnace to accommodate a variety of tube diameters. The work tubes themselves can easily be exchanged to meet the different physical or chemical requirements of a process.

Optional work tube packages enable users to equip the TF for operation under vacuum or modified atmosphere; for such applications, an extended work tube is required. Information can be found on pages 42 – 43.



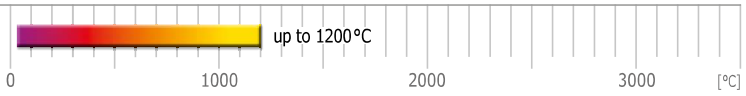
TF1 12/125/1000 with CC-T1 temperature programmer

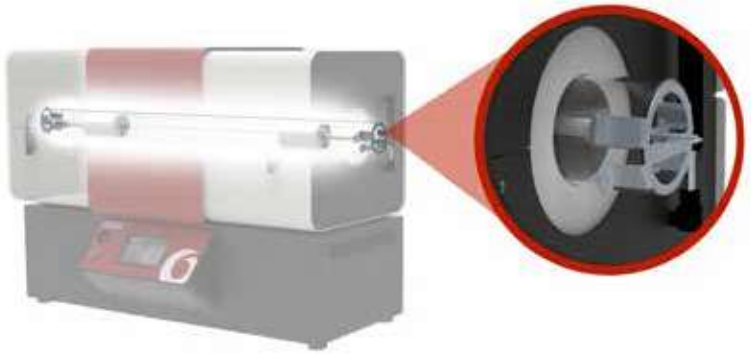
- Low power consumption
- Optimised heating element positions
- Flexible mounting options
- Ethernet fitted as standard
- Temperature programmer as standard

Options (specify these at time of order)

- A range of sophisticated digital controllers, multi-segment programmers and data loggers with digital communication options is available (see pages 36 – 40)
- Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- A range of additional work tubes (page 41), end seals (page 44) and work tube packages (pages 42 – 43) is available for use with modified atmosphere and/or vacuum
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available (page 46)
- Wide choice of tube diameters and materials is available. See page 41 for tube materials
- Insulation plugs and radiation shields to prevent heat loss and improve uniformity
- Vertical mounting stand for the furnace body including bracket for mounting the furnace body to customer's equipment
- 4 m long extension cable to give a total 6 m length of cable between furnace body and control box
- Gas packages with manual valve (page 47)
- Gas packages with electrically operated valve for up to 3 gases (page 47)

TF1 12/60/600 with CC-T1 temperature programmer and optional vertical package





Work tube package for air
shown with a TF1 12/60/600

Detail showing the 'work tube package for air' installed in the furnace.

Work tube package for gas atmosphere
shown with a TS1 12/60/600

Detail showing the work tube support bracket. Work tube packages with extended length work tubes include guards and support brackets as indicated in this image.

Technical data – TF1 Mini

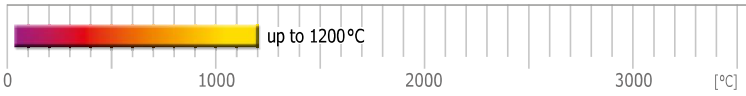
Model	Max. temp. [°C]	Heat-up time [mins]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: Horizontal External H x W x D [mm]	Dimensions: control box H x W x D [mm]	Uniform length ±5 °C [mm]	Max. power [W]	Holding power [W]	Thermo-couple type	Weight [kg]
TF1 11/32/150	1100	27	32	150	300	500	445 x 335 x 470	220 x 335 x 450	58	575	230	K	15

Please note:
- Heat up time is measured to 100 °C below max, using an empty quartz tube & insulation plugs
- Heat up rate when using an optional ceramic work tube must be limited to 5 °C/min
- Holding power is measured at continuous operating temperature
- Uniform temperature lengths are measured with insulation plugs fitted
- Maximum continuous operating temperature is 100 °C below maximum temperature

Technical data – TF1, TF3 Small

Model	Max. temp. [°C]	Heat up time [mins]	Dimensions: Max. outer ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: Horizontal External H x W x D [mm]	Dimensions: control box H x W x D [mm]	Uniform length ±5 °C [mm]	Max. power [W]	Thermocouple Type	Weight [kg]
Single Zone Tube Furnaces TF1												
TF1 12/60/150	1200	40	60	150	430	600	560 x 485 x 480	220 x 485 x 480	93	750	N	31
TF1 12/60/300	1200	35	60	300	580	750	560 x 495 x 480	220 x 485 x 480	177	1500	N	37
TF1 12/60/450	1200	45	60	450	730	900	560 x 645 x 480	220 x 635 x 480	318	2000	N	49
TF1 12/60/600	1200	45	60	600	880	1050	560 x 795 x 480	220 x 785 x 480	474	2500	N	56
3-Zone Tube Furnaces TF3												
TF3 12/60/450	1200	55	60	450	730	900	560 x 645 x 480	220 x 635 x 480	340	2000	N	49
TF3 12/60/600	1200	55	60	600	880	1050	560 x 795 x 480	220 x 785 x 480	501	2500	N	56

Please note:
- Heat up time is measured to 100 °C below max, using an empty quartz tube & insulation plugs
- Heat up rate when using an optional ceramic work tube must be limited to 5 °C/min
- Holding power is measured at continuous operating temperature
- Uniform temperature lengths are measured with insulation plugs fitted
- Maximum continuous operating temperature is 100 °C below maximum temperature



Work tube package for air + vertical stand and vertical tube support package shown with a TF1 12/60/600. Please see page 14 for detail images of the tube support package.

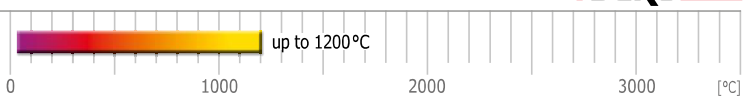
Work tube package for gas atmosphere + vertical stand and vertical tube support package shown with a TF1 12/125/400. Please see page 14 for detail images of the tube support package.

Technical data – TF1, TF3 Medium

Model	Max. temp. [°C]	Heat-up time [mins]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: Horizontal External H x W x D [mm]	Dimensions: control box H x W x D [mm]	Uniform length ±5°C [mm]	Max. power [W]	Holding power [W]	Thermocouple type	Weight [kg]
Single Zone Tube Furnaces TF1													
TF1 12/125/400	1200	88	125	400	750	1000	645 x 665 x 575	220 x 655 x 480	284	1860	1240	N	71
TF1 12/125/600	1200	90	125	600	950	1200	645 x 865 x 575	220 x 855 x 480	456	2510	1500	N	89
TF1 12/125/800	1200	85	125	800	1150	1400	430 x 1065 x 575	220 x 655 x 480*	635	3160	1800	N	102
TF1 12/125/1000	1200	80	125	1000	1350	1600	430 x 1265 x 575	220 x 655 x 480*	847	3810	2100	N	120
TF1 12/125/1200	1200	82	125	1200	1550	1800	430 x 1465 x 575	220 x 655 x 480*	969	4460	2400	N	134
3-Zone Tube Furnaces TF3													
TF3 12/125/600	1200	90	125	600	950	1200	645 x 865 x 575	220 x 855 x 480	507	2510	1500	N	89
TF3 12/125/800	1200	85	125	800	1150	1400	430 x 1065 x 575	220 x 655 x 480*	715	3160	1800	N	102
TF3 12/125/1000	1200	80	125	1000	1350	1600	430 x 1265 x 575	220 x 655 x 480*	855	3810	2100	N	120
TF3 12/125/1200	1200	82	125	1200	1550	1800	430 x 1465 x 575	220 x 655 x 480*	1055	4460	2400	N	134

Please note:
- Heat up time is measured to 100°C below max, using an empty quartz tube & insulation plugs
- Heat up rate when using an optional ceramic work tube must be limited to 5°C/min
- Holding power is measured at continuous operating temperature
- Uniform temperature lengths are measured with insulation plugs fitted
- Maximum continuous operating temperature is 100°C below maximum temperature

* Furnace with separate control box



TS1, TS3 Split Tube Furnaces

With a maximum temperature of 1200 °C, the TS tube furnace range incorporates high-quality heating elements and innovative thermal insulation design to achieve first class performance delivering both reduced case temperatures and power consumption.

The extensive range features three main case sizes, small, medium and large, with multiple heated lengths available. Standard models can be configured to function with a single heated zone (TS1) or three heated zones (TS3) to extend the uniform heated length. Each heated zone of the TS3 benefits from its own dedicated controller and thermocouple.

The TS furnace body is split into two halves and hinged at the rear; pneumatic dampening struts at either end provide a smooth opening action. The ability to open the furnace makes it easier for operators to exchange work tubes, or insert vessels, such as reactors, with end flanges that would make them difficult to insert into a non-split furnace.

An accessory work tube is required to protect the heating elements and support the work piece. The TS range can accommodate work tubes with outside diameters ranging from 60 mm to 200 mm.

TS1 12/125/600 with CC-T1 temperature programmer

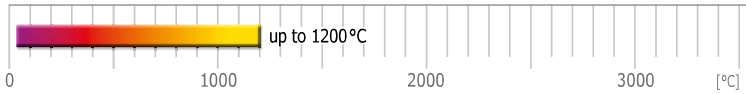
Slide-in accessory work tubes and the use of tube adapters allow a single furnace to accommodate a variety of tube diameters. The work tubes themselves can easily be exchanged to meet the different physical or chemical requirements of a process.

Optional work tube packages enable users to equip the TS for operation under vacuum or modified atmosphere; for such applications, an extended work tube is required. Information can be found on pages 42 – 43.

Standard features

- 1200 °C maximum operating temperature
- Programmable temperature controller with 24 segments.
  - TS1 fitted with Carbolite Gero EPC3016P1
  - TS3 fitted with Carbolite Gero CC-T1
- TS1 (1-zone) Heated length range from 150 to 1200 mm
- TS3 (3-zone) Heated length range from 450 to 1200 mm
- Accepts work tubes with outer diameters from 60 mm up to 200 mm
- Wire elements in high quality vacuum formed insulation ensure fast heat up, excellent temperature uniformity and short cool down times
- Furnace splits into two halves and accommodates tubes or samples fixed into a test rig
- Horizontal configuration mounted on control module for heated lengths up to 600 mm
- Furnace body detachable from the control box to allow use of optional mounting arrangements (see page 6 – 7)
- Horizontal configuration have a separate control module for heated lengths of 800 mm and above
- Control module with 2 metre cable to furnace with plug and socket

TS1 12/125/600 with CC-T1 temperature programmer



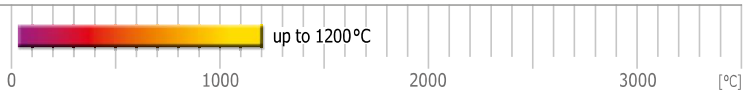
TS1 12/60/150 with CC-T1
and optional vertical package

TS1 12/200/600 with CC-T1 temperature programmer

Options (specify these at time of order)

- A range of sophisticated digital controllers, multi-segment programmers and data loggers with digital communication options is available (see pages 36 – 40)
- Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- A range of additional work tubes (page 41), end seals (page 44) and work tube packages (pages 42 – 43) is available for use with modified atmosphere and/or vacuum
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available (page 46)
- Wide choice of tube diameters and materials is available. See page 41 for tube materials
- Insulation plugs and radiation shields to prevent heat loss and improve uniformity
- Vertical mounting stand for the furnace body including bracket for mounting the furnace body to customer's equipment
- 4 m long extension cable to give a total 6 m length of cable between furnace body and control box
- Gas packages with manual valve (page 47)
- Gas packages with electrically operated valve for up to 3 gases (page 47)

TS1 12/60/150 with CC-T1 temperature programmer



Work tube package for air + vertical stand and vertical tube support package shown with a TS1 12/60/600

Detail showing work tube guiding bracket. This is supplied with the vertical tube support package.

Detail showing the lower work tube support clamp. This is supplied with the vertical tube support package.

Work tube package for gas atmosphere + vertical stand and vertical tube support package shown with a TS1 12/125/400

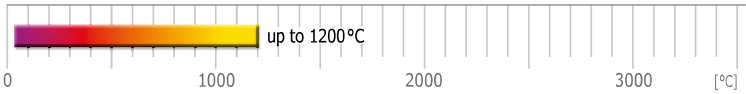
Detail showing work tube guiding bracket. This is supplied with the vertical tube support package.

Detail showing the lower work tube support clamp. This is supplied with the vertical tube support package.

Technical data – TS1, TS3 Small

Model	Max. temp. [°C]	Heat-up time [mins]	Dimensions: Max. outer ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: Horizontal External H x W x D [mm]	Dimensions: control box H x W x D [mm]	Uniform length ±5°C [mm]	Max. power [W]	Thermo-couple Type	Weight [kg]
Single Zone Split Tube Furnaces TS1												
TS1 12/60/150	1200	99	60	150	430	600	560 x 485 x 480 (closed) 765 x 485 x 530 (open)	220 x 485 x 480	77	750	N	31
TS1 12/60/300	1200	46	60	300	580	750	560 x 495 x 480 (closed) 765 x 495 x 530 (open)	220 x 485 x 480	-	1500	N	37
TS1 12/60/450	1200	-	60	450	730	900	560 x 645 x 480 (closed) 765 x 645 x 530 (open)	220 x 635 x 480	-	2000	N	49
TS1 12/60/600	1200	-	60	600	880	1050	560 x 795 x 480 (closed) 765 x 795 x 530 (open)	220 x 785 x 480	-	2500	N	56
3-Zone Split Tube Furnaces TS3												
TS3 12/60/450	1200	-	60	450	730	900	560 x 645 x 480 (closed) 765 x 645 x 530 (open)	220 x 635 x 480	-	2000	N	49
TS3 12/60/600	1200	63	60	600	880	1050	560 x 795 x 480 (closed) 765 x 795 x 530 (open)	220 x 785 x 480	-	2500	N	56

Please note:
- Heat up time is measured to 100°C below max, using an empty quartz tube & insulation plugs
- Heat up rate when using an optional ceramic work tube must be limited to 5°C/min
- Holding power is measured at continuous operating temperature
- Uniform temperature lengths are measured with insulation plugs fitted
- Maximum continuous operating temperature is 100°C below maximum temperature



Technical data – TS1, TS3 Medium

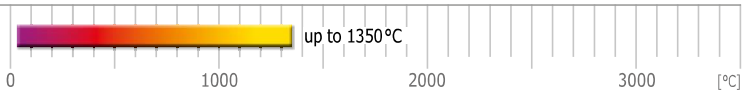
Model	Max. temp. [°C]	Heat-up time [mins]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: Horizontal External H x W x D [mm]	Dimensions: control box H x W x D [mm]	Max. power [W]	Holding power [W]	Thermo-couple type	Weight [kg]
Single Zone Split Tube Furnaces TS1												
TS1 12/125/400	1200	134	125	400	750	1000	645 x 665 x 575 (closed) 905 x 665 x 655 (open)	220 x 655 x 480	1860	1100	N	71
TS1 12/125/600	1200	150	125	600	950	1200	645 x 865 x 575 (closed) 905 x 865 x 655 (open)	220 x 855 x 480	2510	1450	N	89
TS1 12/125/800	1200	147	125	800	1150	1400	430 x 1065 x 575 (closed) 690 x 1065 x 655 (open)	220 x 655 x 480*	3160	1600	N	102
TS1 12/125/1000	1200	147	125	1000	1350	1600	430 x 1265 x 575 (closed) 690 x 1265 x 655 (open)	220 x 655 x 480*	3810	1900	N	120
TS1 12/125/1200	1200	154	125	1200	1550	1800	430 x 1465 x 575 (closed) 690 x 1465 x 655 (open)	220 x 655 x 480*	4460	2350	N	134
3-Zone Split Tube Furnaces TS3												
TS3 12/125/600	1200	113	125	600	950	1200	645 x 865 x 575 (closed) 905 x 865 x 655 (open)	220 x 855 x 480	2510	1450	N	89
TS3 12/125/800	1200	141	125	800	1150	1400	430 x 1065 x 575 (closed) 690 x 1065 x 655 (open)	220 x 655 x 480*	3160	1600	N	102
TS3 12/125/1000	1200	134	125	1000	1350	1600	430 x 1265 x 575 (closed) 690 x 1265 x 655 (open)	220 x 655 x 480*	3810	1900	N	120
TS3 12/125/1200	1200	138	125	1200	1550	1800	430 x 1465 x 575 (closed) 690 x 1465 x 655 (open)	220 x 655 x 480*	4460	2350	N	134

Please note:
- Heat up time is measured to 100°C below max, using an empty quartz tube & insulation plugs
- Heat up rate when using an optional ceramic work tube must be limited to 5°C/min
- Holding power is measured at continuous operating temperature
- Uniform temperature lengths are measured with insulation plugs fitted
- Maximum continuous operating temperature is 100°C below maximum temperature
* Furnace with separate control box

Technical data – TS1, TS3 Large

Model	Max. temp. [°C]	Heat-up time [mins]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: Horizontal External H x W x D [mm]	Dimensions: control box H x W x D [mm]	Max. power [W]	Holding power [W]	Thermo-couple type	Weight [kg]
Single Zone Split Tube Furnaces TS1												
TS1 12/200/600	1200	62	200	600	1300	1300	530 x 1015 x 670 (closed) 845 x 1015 x 760 (open)	220 x 655 x 480*	6600	3400	N	127
TS1 12/200/1200	1200	80	200	1200	1900	1900	530 x 1615 x 670 (closed) 845 x 1615 x 760 (open)	220 x 1255 x 480*	11400	3800	N	192
3-Zone Split Tube Furnaces TS3												
TS3 12/200/600	1200	62	200	600	1300	1300	530 x 1015 x 670 (closed) 845 x 1015 x 760 (open)	220 x 655 x 480*	6600	3400	N	127
TS3 12/200/1200	1200	80	200	1200	1900	1900	530 x 1615 x 670 (closed) 845 x 1615 x 760 (open)	220 x 1255 x 480*	11400	3800	N	192

Please note:
- Heat up time is measured to 100°C below max, using an empty quartz tube & insulation plugs
- Heat up rate when using an optional ceramic work tube must be limited to 5°C/min
- Holding power is measured at continuous operating temperature
- Uniform temperature lengths are measured with insulation plugs fitted
- Maximum continuous operating temperature is 100°C below maximum temperature
* Furnace with separate control box



FHA, FHC – Horizontal and Vertical Tube Furnaces

The FHA, single zone, and FHC, 3-zone, tube furnaces can be used either vertically or horizontally and have a maximum operating temperature of 1350°C.

The extensive F range of tube furnaces is offered with a wide range of accessories. The furnaces comprise ceramic fibre modules with a high quality 5 mm APM wire heating element mounted in the insulation, held in position by a ceramic holding ridge. The low thermal mass ceramic fibre insulation ensures low energy consumption and allows fast heating rates. The control thermocouple is a high grade type S thermocouple. Additionally, the tube furnace is available with up to 8 heating zones for the most precise temperature control and uniformity.

FHA 13/80/500

Control module with optional CC-T1 touchscreen programmer

Standard features

- 1350°C maximum operating temperature
- Programmable temperature controller with 24 segments.
  - FHA fitted with Carbolite Gero EPC3016P1
  - FHC fitted with Carbolite Gero CC-T1
- Over-temperature controller with independent thermocouple
- Accepts work tubes with outer diameters up to 110 mm
- Heated lengths of 200, 500, 750, 1000 or 1250 mm
- Use in horizontal or vertical orientation
- Exceptional lifetime and temperature stability
- High grade thermocouple type S
- Low thermal mass ceramic fibre insulation
- High quality 5 mm APM wire heating element
- Furnace fitted with separate control box with 3 m cable, plug and socket
- NEW Ethernet communications

Options (specify these at time of order)

- A range of sophisticated digital controllers, multisegment programmers and data loggers with digital communication options is available (see pages 36–40)
- Wide choice of tube diameters and materials is available. See page 41 for tube materials
- 'L' stand for vertical usage
- Insulation plugs & radiation shields to prevent heat loss & improve uniformity (see page 45)
- Modified atmosphere and vacuum assemblies are available (see page 45)
- Larger tube diameters on request
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available (page 46)
- Oxygen sensor for inert gas packages
- 6 m length of cable between furnace body and control box with plug and socket

FHA 13/110/1000 with optional basic inert gas package and optional L-stand

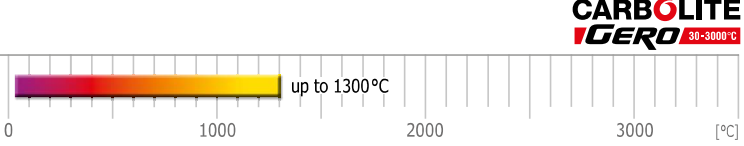
FHA 13/80/500 with optional CC-T1 controller, voltage/current display and high vacuum capable inert gas package.
Rotary vane pumps and turbo pumps available (see page 46)

Technical data

Tube furnace FHA (single zone) and FHC (three zones) both available in horizontal and vertical arrangement (with optional 'L' stand)

Model	Max. temp. [°C]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: External furnace *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]
Horizontal and Vertical Tube Furnaces (may need further equipment) FHA											
FHA 13/32/200	1350	32	200	390	925	420 x 400 x 350	25	480 x 560 x 500	50	100	1200
FHA 13/32/500	1350	32	500	690	1225	420 x 700 x 350	30	480 x 560 x 500	50	250	2400
FHA 13/50/200	1350	50	200	390	925	420 x 400 x 350	30	480 x 560 x 500	50	100	1500
FHA 13/50/500	1350	50	500	690	1225	420 x 700 x 350	35	480 x 560 x 500	50	250	3600
FHA 13/50/750	1350	50	750	940	1475	420 x 950 x 350	40	850 x 560 x 500	60	375	5400
FHA 13/80/200	1350	80	200	390	925	420 x 400 x 350	35	480 x 560 x 500	50	100	2100
FHA 13/80/500	1350	80	500	690	1225	420 x 700 x 350	40	480 x 560 x 500	60	200	5200
FHA 13/80/750	1350	80	750	940	1475	420 x 950 x 350	50	850 x 560 x 500	70	375	7800
FHA 13/80/1000	1350	80	1000	1190	1725	420 x 1200 x 350	80	850 x 560 x 500	90	500	10400
FHA 13/110/500	1350	110	500	690	1225	590 x 700 x 520	55	850 x 560 x 500	70	250	7800
FHA 13/110/750	1350	110	750	940	1475	590 x 950 x 520	70	850 x 560 x 500	90	375	11500
FHA 13/110/1000	1350	110	1000	1190	1725	590 x 1200 x 520	100	1100 x 1200 x 700	90	500	16000
FHA 13/110/1250	1350	110	1250	1440	1975	590 x 1450 x 520	130	1100 x 1200 x 700	90	610	20000
3-Zone Horizontal and Vertical Tube Furnaces (may need further equipment) FHC											
FHC 13/32/500	1350	32	500	690	1225	420 x 700 x 350	30	480 x 560 x 500	50	350	2400
FHC 13/50/500	1350	50	500	690	1225	420 x 700 x 350	35	480 x 560 x 500	50	350	3600
FHC 13/50/750	1350	50	750	940	1475	420 x 950 x 350	40	850 x 560 x 500	60	550	5400
FHC 13/80/500	1350	80	500	690	1225	420 x 700 x 350	40	480 x 560 x 500	60	350	5200
FHC 13/80/750	1350	80	750	940	1475	420 x 950 x 350	50	850 x 560 x 500	70	550	7800
FHC 13/80/1000	1350	80	1000	1190	1725	420 x 1200 x 350	80	850 x 560 x 500	90	800	10400
FHC 13/110/500	1350	110	500	690	1225	590 x 700 x 520	55	850 x 560 x 500	70	300	7800
FHC 13/110/750	1350	110	750	940	1475	590 x 950 x 520	70	850 x 560 x 500	90	500	11500
FHC 13/110/1000	1350	110	1000	1190	1725	590 x 1200 x 520	100	1100 x 1200 x 700	90	750	16000
FHC 13/110/1250	1350	110	1250	1440	1975	590 x 1450 x 520	130	1100 x 1200 x 700	90	950	20000

Please note:
- Heat up rate when using an optional ceramic work tube must be limited to 5 °C/min
- *Further to the depth of the control module 150 mm for the power plugs and other plugs needs to be added
- 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



FST, FZS – Horizontal and Vertical Split Tube Furnaces

The FST, single zone, and FZS, 3-zone, split tube furnaces can be used either vertically or horizontally and have a maximum operating temperature of 1300 °C.

The split heating module allows either easy positioning of the work tube or positioning around reactors which have fixed end flanges. The split design may also allow faster cooling of the sample. Cooling channels are engineered into the housing to aid with convection cooling of the outer case. A handle is attached to the upper half of the split tube furnace with two quick-release clamps to safely unlock and lock the furnace. The two furnace halves are ceramic fibre modules with high quality APM wire heating elements mounted in the insulation, held in position by a ceramic holding ridge. A safety switch protects the operator by switching off the heating elements once the furnace is opened.

FST 13/70/500 with optional CC-T1 controller

Control module with optional CC-T1 touchscreen programmer

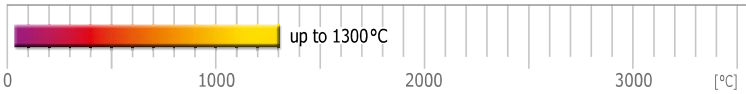
Standard features

- 1300 °C maximum operating temperature
- Programmable temperature controller with 24 segments.
  - FST fitted with Carbolite Gero EPC3016P1
  - FZS fitted with Carbolite Gero CC-T1
- Over-temperature controller with independent thermocouple
- Accepts work tubes with outer diameter up to 150 mm
- Single-zone heated lengths of 200, 500 or 1000 mm
- 3-zone heated lengths of 500 or 1000 mm
- Split design allows work tubes or reactors with fixed flanges to be accommodate
- For horizontal or vertical use
- Exceptionally long life time and temperature stability
- High grade type S thermocouple
- Low thermal mass ceramic fibre insulation
- High quality 5 mm APM wire heating elements
- Supplied with separate control box with 3 m cable, plug and socket
- NEW Ethernet communications

Options (specify these at time of order)

- A range of sophisticated digital controllers, multisegment programmers and data loggers with digital communication options is available (see pages 36 – 40)
- Wide choice of tube diameters and materials is available. See page 41 for tube materials
- For split tube furnaces, robustly shaped ceramic half tubes are available to protect the heating elements and for sample holding
- 'L' stand for vertical and/or horizontal use
- Insulation plugs & radiation shields to prevent heat loss & improve uniformity (see page 45)
- Modified atmosphere and vacuum packages are available (see page 45)
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available (page 46)
- Larger tube diameters
- Longer heated lengths
- Automated opening mechanism
- Flanges for inert gas counter flow
- Oxygen sensor for inert gas packages
- 6 m length of cable between furnace body and control box with plug and socket
- Gas packages with manual valve (page 47)
- Gas packages with electrically operated valve for up to 3 gases (page 47)

Custom designed 3-zone FZS 13/100/4500 with 4500 mm heated length, automated opening and APM work tube



Interior view of custom designed FZS with flanges for inert gas counter flow for open operation during inert gas heat treatment

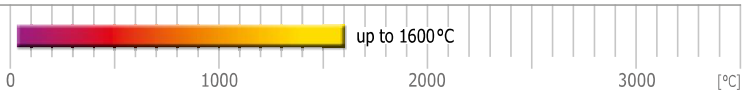
Custom designed 6-zone FZS 13/100/3000 with 3000 mm heated length and counter flow flanges. For simultaneous heat treatment of four carbon fibres under inert gas atmosphere. Supplied with separate control cabinet.

Technical data

Model	Max. temp. [°C]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: External furnace 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]
Single Zone Horizontal and Vertical Split Tube Furnaces FST (may need further equipment)											
FST 13/40/200	1300	40	200	450	985	530 x 460 x 560	35	480 x 560 x 500	50	100	1500
FST 13/70/500	1300	70	500	670	1205	530 x 680 x 560	50	480 x 560 x 500	50	250	3000
FST 13/100/500	1300	100	500	670	1205	530 x 680 x 560	75	850 x 560 x 500	60	250	4000
FST 13/100/1000	1300	100	1000	1190	1725	530 x 1200 x 560	80	850 x 560 x 500	90	500	10400
FST 13/150/1000	1300	150	1000	1190	1725	590 x 1200 x 560	100	850 x 560 x 500	90	500	12000
3-Zone Horizontal and Vertical Split Tube Furnaces FZS (may need further equipment)											
FZS 13/70/500	1300	70	500	670	1205	530 x 680 x 560	50	480 x 560 x 500	50	350	3000
FZS 13/100/500	1300	100	500	670	1205	530 x 680 x 560	75	850 x 560 x 500	60	300	4000
FZS 13/100/1000	1300	100	1000	1190	1725	530 x 1200 x 560	80	1100 x 1200 x 700	90	800	10400
FZS 13/150/1000	1300	150	1000	1190	1725	590 x 1200 x 560	100	1100 x 1200 x 700	90	600	12000
FZS 13/200/1000	1300	200	1000	1190**	1725**	690 x 1200 x 620	150	1100 x 1200 x 700	120		16000
3-Zone Horizontal Split Tube Furnaces FZS (may need further equipment)											
FZS 13/100/1500	1300	100	1500	1690	2225	530 x 1700 x 560	120	1100 x 1200 x 700	120		14000
FZS 13/100/4500	1300	100	4500	on request	on request	2200 x 4700 x 1100	800	inside frame	-		45000
FZS 13/150/1500	1300	150	1500	1690**	2225**	590 x 1700 x 560	150	1100 x 1200 x 700	120		18000
FZS 13/150/4500	1300	150	4500	on request	on request	2200 x 4700 x 1200	950	inside frame	-		60000
FZS 13/200/1500	1300	200	1500	1690**	2225**	690 x 1700 x 620	200	1100 x 1200 x 700	160		22000

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

*Further to the depth of the control module 150 mm for the power plugs and other plugs needs to be added
**(APM or quartz)



TF1, TF3 Tube Furnaces, 1600 °C

The TF tube furnaces achieve first class performance with low power consumption and low case temperature due to the use of high-quality heating elements and thermal insulation design. Maximum temperature of 1600 °C is available.

The range includes small and medium case sizes and two heated lengths in each size. The TF1 are single zone furnaces and the TF3 are three zone furnaces which further extend the uniform heated length.

Work tubes with outside diameters of 60 mm and 100 mm can be fitted. The use of an accessory slide-in work tube protects the heating element and is required to support the work piece.

The 3-zone TF3 furnaces provide excellent temperature uniformity resulting from division of the heated length into 3-zones with its own controller and thermocouple.

Should vacuum or a modified atmosphere be required, it is necessary to use a slide-in work tube of adequate length needed to fit end seals. In some circumstances a work tube that has different physical or chemical properties may be required. This information can be found on page 41.
The benefit of this design is its flexibility; with the use of tube adapters the same furnace can be used with a variety of tube diameters.

TF1 16/60/300 with CC-T1 temperature programmer

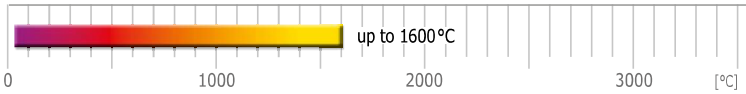
TF1 16/100/450 with vertical package

Standard features

- 1600 °C maximum operating temperature
- Programmable temperature controller with 24 segments.
  - TF1 fitted with Carbolite Gero EPC3016P1
  - TF3 fitted with Carbolite Gero CC-T1
- Over temperature controller with independent thermocouple
- Ethernet Communications
- TF1 (1-zone) Heated length range from 180 to 600 mm
- TF3 (3-zone) Heated lengths of 450 and 600 mm
- Accepts work tubes with outer diameters from 60 mm up to 100 mm
- Silicon carbide elements ensure fast heat up and excellent temperature uniformity
- Horizontal configuration mounted on control module
- Furnace body detachable from the control box to allow use of optional mounting arrangements (see pages 6 – 7)
- Control module with 2 metre cable to furnace with plug and socket

Options (specify these at time of order)

- A range of sophisticated digital controllers, multi-segment programmers and data loggers with digital communication options is available (see pages 36 – 40)
- A range of additional work tubes (page 41), end seals (page 44) and work tube packages (pages 42 – 43) is available for use with modified atmosphere and/or vacuum
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available (page 46)
- Wide choice of tube diameters and materials is available. See page 41 for tube materials
- Insulation plugs and radiation shields to prevent heat loss and improve uniformity
- Vertical mounting stand for the furnace body including bracket for mounting the furnace body to customer's equipment
- 4 m long extension cable to give a total 6 m length of cable between furnace body and control box
- Gas packages with manual valve (page 47)
- Gas packages with electrically operated valve for up to 3 gases (page 47)



View inside

1. Centre zone heating element
2. End zone heating elements
3. Thermal insulation
4. 3-zone temperature control
5. Work tube

TF3 16/100/450 with CC-T1 controller

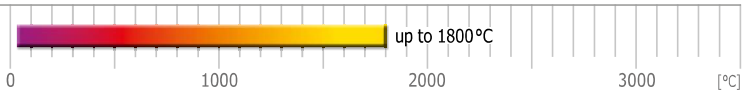
Technical data – TF1 1600 °C Small

Model	Max. temp. [°C]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: External H x W x D [mm]	Uniform length ±5 °C [mm]	Max. power [W]	Holding power [W]	Thermo-couple type	Weight [kg]
Single Zone High Temperature Tube Furnaces TF1 Small											
TF1 16/60/180	1600	60	180	680	900	650 x 595 x 585	100	2500	1300	R	43
TF1 16/60/300	1600	60	300	800	1020	650 x 715 x 585	175	4000	1600	R	51

Technical data – TF1, TF3 1600 °C Medium

Model	Max. temp. [°C]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	Dimensions: External H x W x D [mm]	Uniform length ±5 °C [mm]	Max. power [W]	Holding power [W]	Thermo-couple type	Weight [kg]
Single Zone High Temperature Tube Furnaces TF1 Medium											
TF1 16/100/450	1600	100	450	1030	1250	775 x 940 x 705	-	6000	-	R	90
TF1 16/100/600	1600	100	600	1180	1400	775 x 1090 x 705	425	7000	3700	R	100
3-Zone High Temperature Tube Furnaces TF3											
TF3 16/100/450	1600	100	450	1030	1250	775 x 940 x 705	375	6800	-	R	90
TF3 16/100/600	1600	100	600	1180	1400	775 x 1090 x 705	460	8000	3700	R	100

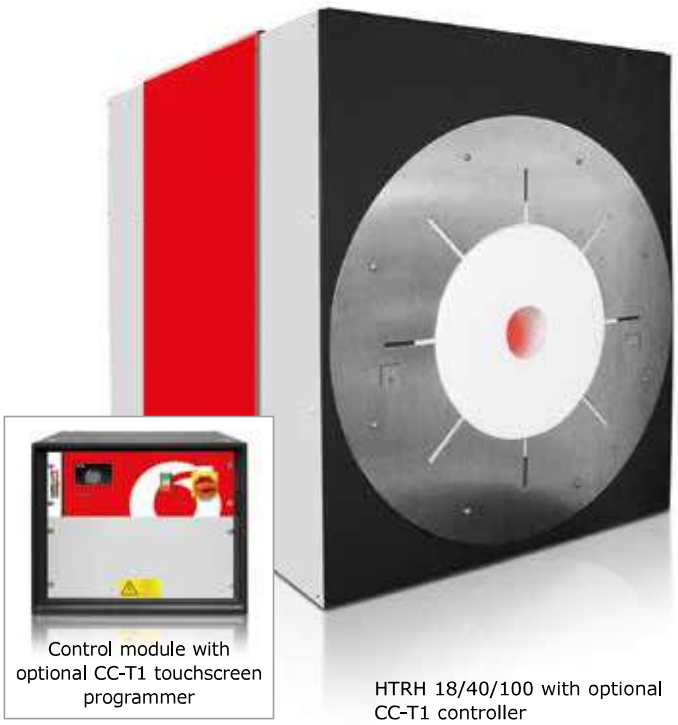
Please note:
- Heat up time is measured to 100 °C below max, using an empty quartz tube & insulation plugs
- Heat up rate when using an optional ceramic work tube must be limited to 5 °C/min
- Holding power is measured at continuous operating temperature
- Uniform temperature lengths are measured with insulation plugs fitted
- Maximum continuous operating temperature is 100 °C below maximum temperature



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 ($MoSi_2$) 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, $MoSi_2$ develops an oxide (SiO_2) layer, which protects the heating elements against further thermal or chemical corrosion.



Control module with optional CC-T1 touchscreen programmer

HTRH 18/40/100 with optional CC-T1 controller

Standard features

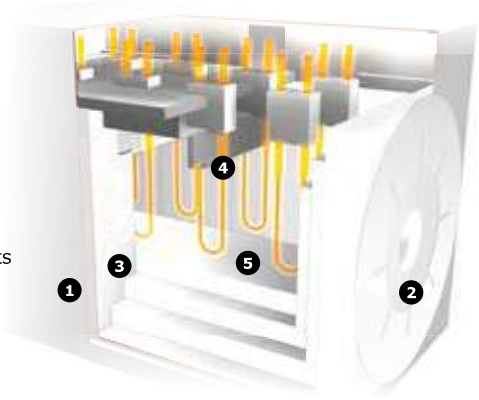
- 1800 °C maximum operating temperature
- Programmable temperature controller with 24 segments.
  - HTRH fitted with Carbolite Gero EPC3016P1
  - HTRH-3 fitted with Carbolite Gero CC-T1
- Over-temperature protection
- Accepts work tubes with outer diameters up to 100 mm for use with modified atmosphere
- 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 $MoSi_2$ 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
- NEW Ethernet communications

Options (specify these at time of order)

- A range of sophisticated digital controllers, multisegment programmers and data loggers with digital communication options is available (see pages 36 – 40)
- A range of additional work tubes is available in a variety of materials (see page 41)
- Insulation plugs & radiation shields are strongly recommended for high temperature vertical tube furnaces to prevent heat loss & improve uniformity (see page 45)
- Modified atmosphere and vacuum assemblies are available (see page 45)
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available (page 46)
- Oxygen sensor for inert gas packages
- Gas packages with manual or automatic valve for up to 3 gases (page 47)
- 6 m long cable between furnace body and control box with plug and socket

View inside

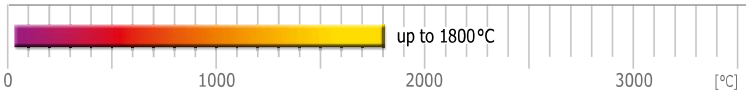
1) Outer case
2) Ceramic fibre end insulation
3) Ceramic fibre case insulation
4) Heating elements
5) Ceramic fibre inner insulation



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.

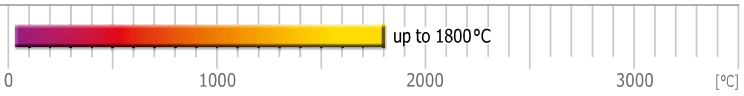


Horizontal High Temperature Tube Furnace HTRH 18/70/600 with optional EPC3008P10 programmer and optional high vacuum capable inert gas package (high vacuum capable up to 1450 °C and up to 1800 °C under normal pressure. Rotary vane pumps and turbo pumps optional available (see page 46).

Technical data

Model	Max. temperature [°C]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	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]
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

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 ($MoSi_2$) 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, $MoSi_2$ 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.

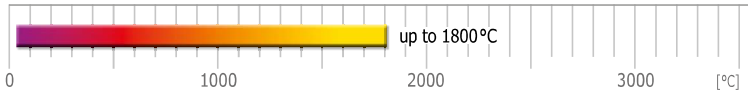
Furnaces are supplied without a stand, allowing customers to build them into their own equipment. Optional 'L' stands are available allowing the furnaces to be self supporting.

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
- Carbolite Gero EPC3016P1 programmable temperature controller with 24 segments
- Over-temperature controller with independent thermocouple
- 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 $MoSi_2$ elements
- Rectangular housing with holes for convection cooling
- Furnace comes with separate control box with 3 m cable, plug and socket
- NEW Ethernet communications

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



Options (specify these at time of order)

- A range of sophisticated digital controllers, multisegment programmers and data loggers with digital communication options is available (see pages 36–40)
- A range of additional work tubes is available in a variety of materials (see page 41)
- Insulation plugs & radiation shields are strongly recommended for high temperature vertical tube furnaces to prevent heat loss & improve uniformity (see page 45)
- Modified atmosphere and vacuum packages are available (see page 45)
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available (page 46)
- Stand for convenient and safe usage
- Oxygen sensor for inert gas packages
- Gas packages with manual or automatic valve for up to 3 gases (page 47)
- 6 m long cable between furnace body and control box with plug and socket

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

Technical data

Model	Max. temperature [°C]	Dimensions: Max. outer Ø accessory tube [mm]	Dimensions: Heated length [mm]	Recommended tube length for use in air [mm]	Recommended tube length for use with modified atmosphere [mm]	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]
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

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