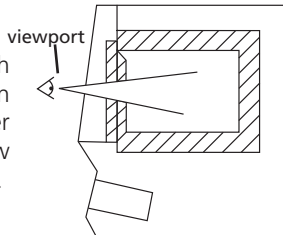


Box Furnace Options

Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all box furnace options.

Access and/or Viewing Port

A 1" diameter hole is placed through the furnace door. Optionally select an open hole with a stainless steel cover disc that pivots, or a quartz window that is permanently fitted in the hole.



Additional Thermocouple

An additional thermocouple, similar to the control thermocouple, is built into the furnace and connected to a thermocouple socket. This TC socket is mounted in the furnace control panel. Typically used by the customer for connection to a recorder or other temperature measurement device.

Thermocouple Calibration Port

An additional thermocouple ceramic sheath is installed adjacent to the control thermocouple and accessed through the back of the furnace. Allows insertion of a customer's reference thermocouple for checking or calibration of the existing controller/thermocouple system.

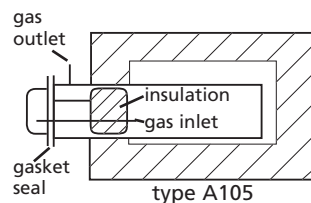
Inert Gas Inlet

A 6 mm hose connection on the rear of furnace is connected to a ceramic tube that extends into the chamber. This option is suitable only for inert gases or oxygen.

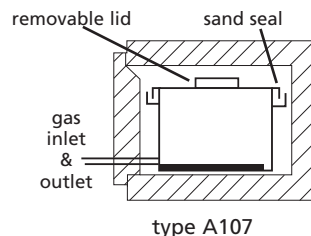
NOTE: Carbolite box furnaces are not gas tight. Gas introduction may affect the furnace heating characteristics and/or the performance of some heating elements. (Contact Carbolite with questions.)

Atmosphere Retorts (1100°C)

Gas tight inonel enclosures designed specifically to fit in standard Carbolite box furnaces. Type A105 style retort is designed with easily removable insulated front plug door. Gas inlet and outlet pipes are accessible near front of retort. The normal furnace door mechanism is retained for use when the retort is removed.



Type A107 style retorts are similar to a pack carburizing box using a sand seal between the deep base and shallow removable lid. Gas inlet and outlet pipes extend from the front of the retort through slots in the furnace door.

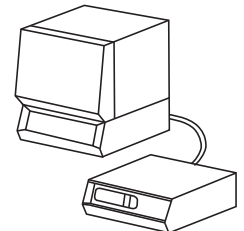


Thermocouple Gland

A thermocouple gland may be installed in the A105 or A107 retort, and gas tight end seals for process tubes. A 1.5mm or 3mm gland is available to seal a mineral insulated probe thermocouple, or a 10 mm gland to seal a ceramic sheath. See page 45 for information on thermocouple probes.

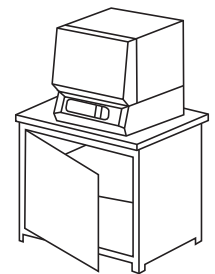
Separate Controls

A separate control cabinet incorporates all temperature control and power control components normally installed in the box furnace cabinetry. A blank panel replaces the control panel in the furnace base.



Furnace Support Cabinet

A furnace support cabinet with a single internal shelf is available in three sizes to accommodate various box and tube furnace models. Cabinet incorporates a heat resisting stainless steel top surface.



Tube Furnace Options

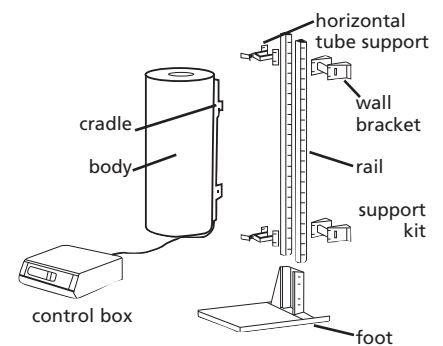
Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all tube furnace options.

Process Tubes

Carbolite offers multiple diameters and lengths of process tubes suitable for use with Carbolite or other manufacturer tube furnaces. Mullite, high purity alumina, quartz and alloy tubes are available.

Mounting Options

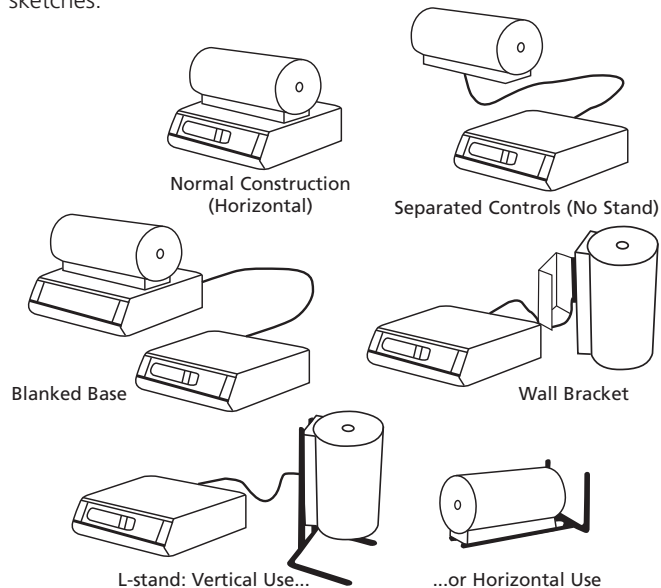
Large bore "G" style tube furnaces are normally provided for horizontal operation as shown in the photo on page 34. Alternatively, these tube furnaces can be provided for vertical operation. See adjacent sketch.



G range - versatile
No Stand: control box with body & cradle only
No Foot: everything except the foot

Furnace Options

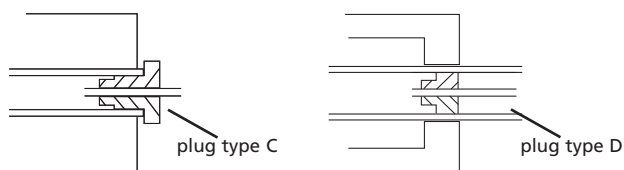
Non-split tube furnaces such as the MTF, CTF and STF, and the matching TZF models are supplied as standard for horizontal use. Alternate mounting options are available as depicted in the sketches.



Split-hinge VST & TVS tube furnaces are also available with different mounting options. See page 33.

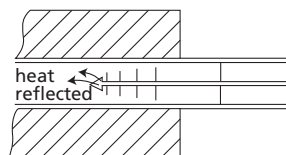
Insulating Plugs

Ceramic fiber insulating plugs installed near the ends of process tubes reduce heat losses and improve uniformity. Type C insulating plugs are designed for applications when processing will be done under air, and are suitable for use with tubes of 1.5" ID and larger. Type D insulating plugs are normally used in conjunction with gas tight end seals when processing is carried out under an atmosphere. Suitable for use with tubes of 2" ID and larger.



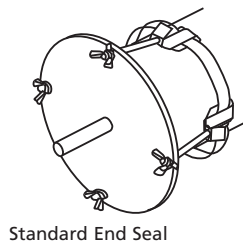
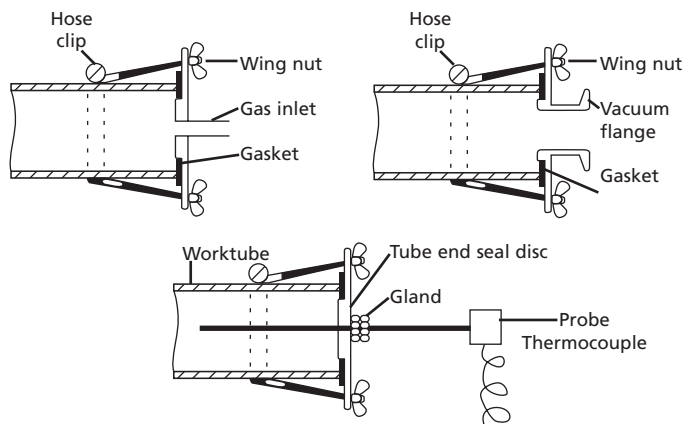
Radiation Shields

Radiation shields are typically used for applications where ceramic fiber plugs are unsuitable, e.g. where a high purity atmosphere or vacuum is required. Normally used in conjunction with gas tight end seals when processing is carried out under atmosphere. Suitable for use with tubes of 2" ID and larger. Radiation shields designed for operating temperatures up to 1200°C are fabricated of inconel, and above 1200°C, are fabricated of alumina.

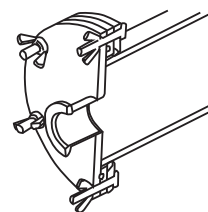


Gas Tight End Seals

Gas tight end seals provide a convenient method of sealing each end of an open end process tube. Each standard end seal is fitted with a 6 mm hose connection for gas inlet or outlet. Optional vacuum flanges and glands for probe thermocouples can also be installed in the end seals. Gas tight end seals are appropriate for tube diameters of 2" or larger. Standard end seals are suitable for vacuums to 10^{-3} mbar. For higher vacuums to 10^{-5} mbar, a double flange end seal design is available. (Depicted below)



Standard End Seal



High Vacuum End Seal

Special Size Tube Furnaces

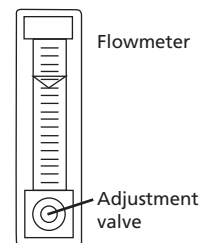
MTF, CTF & TZF wirewound tube furnaces (pages 30 & 31), HST, HZS, VST & TVS split-hinge tube furnaces (pages 32 & 33) and GHA & GHC large bore tube furnaces (page 34) can be provided with special heated and/or zone lengths. Wirewound tube furnaces can also be provided with special diameter work tubes.

Gas Control Options

Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all gas control options.

Gas Flowmeters

Multiple gas flowmeters with a standard scale length of 100 mm (3% accuracy) with needle valve are available for use with gas inlets and retorts. A mounting bracket is included.



Inert Gas Inlet

See description under Box Furnace Options.

Solenoid Valves

An electric valve used to start and stop a gas flow. May be activated manually by a panel mounted switch, or automatically through a program segment output or temperature alarm relay.

Atmosphere Control System

Recommended when hydrogen gas is required for processing. Provides greater safety and convenience in control of hydrogen and nitrogen purge gas. Protects H₂ introduction at low temperatures, provides a monitored burn-off pilot flame, and senses failure of the gas supplies. Includes H₂ and N₂ flowmeters and is provided in a separate cabinet. Suitable for use with box furnace Type A105 atmosphere retorts or gas tight tubes installed in tube furnaces. Uses a pressure system. For mass flow system, please contact Carbolite.

Temperature Measurement Options

Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all temperature measurement options.

Temperature Indicator

A digital temperature indicator is built into the furnace control panel and wired to a panel mounted thermocouple socket. Intended for use with a probe thermocouple. Also available in a separate stand alone cabinet, so it can be used as a portable temperature checker.

Chart & Data Acquisition Recorders

Carbolite can offer both Chart and Data Acquisition Recorders in single and multiple channel models. Assorted optional features are available with all recorders. The recorder is mounted in the furnace control panel when space permits, or alternatively in a separate cabinet.

Thermocouple Probes

Normally used to monitor temperatures in tube furnaces. Semi-flexible metal sheathed mineral insulated Type K and Type N thermocouples are available in 24" and 39" lengths in 1.5 mm and 3.0 mm diameters. Type R, B and Pt 20% Rh/Pt 40% Rh thermocouples are available in 21", 27" and 33" lengths. Because these thermocouples are very fragile, it is recommended that the thermocouple be combined with an optional 10 mm diameter alumina protection sheath. Each probe thermocouple is fitted with 3' or 6' of compensating leadwire and plug.

Control System Options

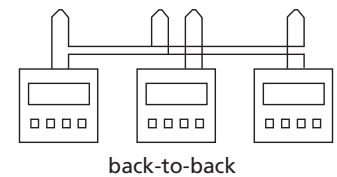
Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all control system options.

Optional Programmers

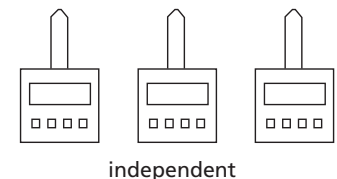
See details on page 4 for additional programmer information.

Three Zone Controls

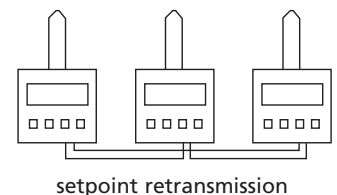
The usual purpose of a three zone furnace and control system is to provide a longer uniform working zone within the furnace. Carbolite's standard three zone control system is a back-to-back thermocouple system with slave end zone controls.



An alternate three zone control system is to provide three totally independent temperature controllers tied directly to individual thermocouples positioned in each zone of the furnace. This is a no charge option.



When controlled programmed cooling is a critical requirement in your program, the Retransmission of Setpoint Option must be ordered. Unfortunately, a disadvantage of a programmable three zone system with slave end zones is its inability to effectively cool at a programmed rate.

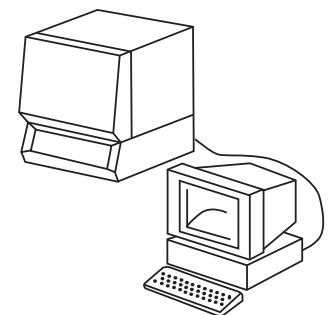


Retransmission of Setpoint

If you require programmed cooling with a three zone tube furnace, the Retransmission of Setpoint Option is required. This option provides control of the end controls setpoint via an analog signal transmitted from the center zone programmable controller. The standard differential thermocouple design is not suitable for programmed cooling.

Digital Communications

Optionally select RS232 or RS485 digital communications. RS232 permits a single controller to communicate with a computer. RS485 permits multiple controllers to communicate with a computer through "daisy chaining" of the instruments. Digital communications is wired to panel mounted sub-miniature "D" socket on rear of furnace.



RS232/485 converter allows connection of furnace control system with RS485 to PC fitted with RS232.

RS232 and RS485 cables are available for connection between furnace and PC, as well as cables to "daisy chain" several furnaces together when operating with a RS485 connection.

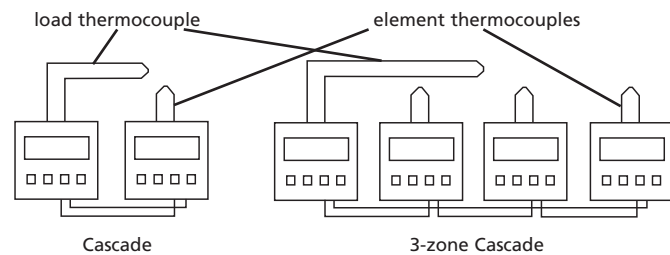
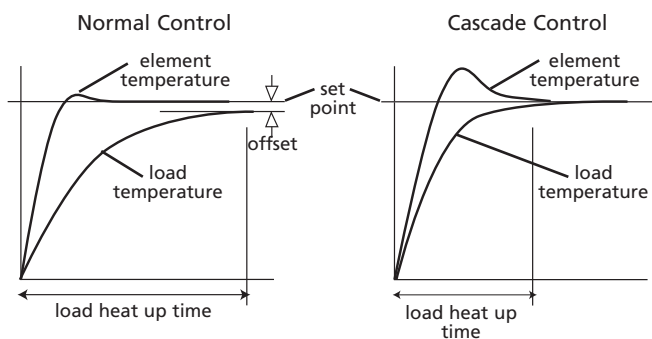
Furnace Options

ITools and SpecView Software

Carbolite offers ITools and SpecView software that allows instruments to be setup, monitored and recorded from a PC. Contact Carbolite for complete descriptions.

Cascade Control

This control system adds a second thermocouple and controller to the furnace. The additional thermocouple is placed close to the load and connected to the primary controller (load control). The other thermocouple senses the temperature near the heating elements and is connected to the second controller (element control). The Cascade Control System allows you to heat the furnace load at a faster rate and control it more precisely than the conventional one controller one thermocouple temperature control system. Cascade control is not available with the 301 controller.



Temperature Alarm Relay

Connection from a relay in the controller to a panel mounted jack, providing a volt-free relay output. Available with programmable controllers.

Program Segment Output

As above, but triggered by entering a part or parts of a time/temperature program. Available with 3508P1 programmer.

Audible Alarm

An addition to either of the previous two options. Alarm is cancelled by program skip or setpoint adjustment, or a separate cancellation button. Audible alarm may also be provided with over-temperature protection, with alarm cancellation button.

Analog Communications

DC retransmission of PV or Setpoint output connected to panel jack. Available with programmable controllers.

Over-Temperature Protection

See description on page 4.

Fluidized Bath Accessories

Contact Carbolite regarding application questions, and for detailed descriptions, specifications, and pricing of all fluidized bath accessories.

Laboratory Fluidized Bath Accessories	
Model SBS-4 Part No.	Description
7030783	Pressure Regulator with Gauge
7030784	Air Filter
6037807	Parts Basket
6031116	Overspill Flange
7030462	20 lb. Aluminum Oxide
3012000	TC-8D Temperature Controller

Note: Contact Carbolite if an air compressor is required.

Industrial Fluidized Bath Accessories		
IFB-51 Part No.	IFB-52 Part No.	Description
6035915	6035915	Pressure Regulator w/ Filter
7031103	7031658	Parts Basket (standard)
7031102	7031659	Parts Basket (long)
6036157	6036157	Extraction Collar
6036156	6036156	Lid Assembly
7031154	7031154	Cyclone CN-100
7030772	7030772	Extraction Fax
7030464	7030464	100 lb. Aluminum Oxide

Note: Contact Carbolite if an air compressor is required.