CARBOLITE®
a VERDER company


# TUBE FURNACE UP TO 1350°C - FHA / FHC

**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.

## STANDARD FEATURES

- 1350 °C maximum operating temperature
- Programmable temperature controller with 24 segments: FHA fitted with EPC3016P1, FHC fitted with CC-T1
- Over-temperature protection
- 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 type S thermocouple
- Low thermal mass ceramic fibre insulation
- High quality 5 mm APM wire as heating element
- Furnace fitted with separate control box with 3 m cable, plug and socket
- 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 - more information about controllers
- Wide choice of tube diameters and materials is available: eg quartz, ceramic, metal
- 'L' stand for vertical usage
- Insulation plugs & radiation shields to prevent heat loss & improve uniformity
- Modified atmosphere and vacuum assemblies are available - more information
- Larger tube diameters on request
- Vacuum packages with a choice of rotary vane pump or turbomolecular pump are available for furnaces with tube inner diameters of 60 mm and above
- Oxygen sensor for inert gas packages
- 6 m length of cable between furnace body and control box with plug and socket
- Laboratory Gas Safety System for safe use with hydrogen above 750 °C

# MOUNTING CONFIGURATIONS

**FURNACE BODY AND SEPARATE CONTROL BOX**

**OPTION: VERTICAL STAND**

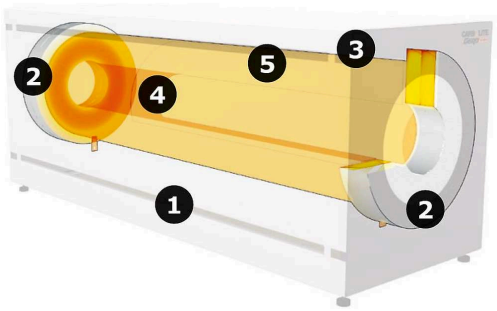


# TECHNICAL DETAILS

**View inside of the tube furnace**

1. outer case
2. end insulation
3. case insulation
4. heating elements
5. inner insulation (hot face)

The rectangular housing is constructed with slots for convection cooling of the outer housing. With insulation made from low thermal mass ceramic fibre material, the heat conduction is reduced to a minimum.




View inside

Inside the tube furnace, the heating element is constructed of vacuum formed fibres containing free radiating heating elements that are attached to the insulation by a ceramic holding ridge.

When compared to conventional heating methods, the 5 mm thick heating wires are combined with a low voltage, heavy-weight transformer power supply that provides an extraordinary long lifetime of the heating elements and temperature stability. The control thermocouple is a high grade type S thermocouple. Additionally, each tube furnace model is available with up to 8 heating zones for the most precise temperature control and uniformity.

TUBE FURNACE UP TO 1350°C - FHA / FHC

# TECHNICAL DATA

| | FHA 13/32/200 | FHA 13/32/500 | FHA 13/50/200 |
|---|---|---|---|
| **Number of heated zones** | 1 | 1 | 1 |
| **Max temp (°C)** | 1350 | 1350 | 1350 |
| **Furnace Ø (mm)** | 32 | 32 | 50 |
| **Heated length (mm)** | 200 | 500 | 200 |
| **Furnace dimensions H x W x D (mm)** | 420 x 400 x 350 | 420 x 700 x 350 | 420 x 400 x 350 |
| **Furnace weight (kg)** | 25 | 30 | 30 |
| **Tube length for use in air (mm)** | 390 | 690 | 390 |
| **Tube length for use with modified atmosphere (mm)** | 925 | 1225 | 925 |
| **Control module dimensions H x W x D (mm)** | 500 x 550 x 700 | 500 x 550 x 700 | 500 x 550 x 700 |
| **Control module weight (kg)** | 50 | 50 | 50 |
| **Uniform length ±5°C (mm)** | 100 | 250 | 100 |
| **Power (kW)** | 1.2 | 2.4 | 1.5 |

| | FHA 13/50/500 | FHA 13/50/750 | FHA 13/80/200 |
|---|---|---|---|
| **Number of heated zones** | 1 | 1 | 1 |
| **Max temp (°C)** | 1350 | 1350 | 1350 |
| **Furnace Ø (mm)** | 50 | 50 | 80 |
| **Heated length (mm)** | 500 | 750 | 200 |
| **Furnace dimensions H x W x D (mm)** | 420 x 700 x 350 | 420 x 950 x 350 | 420 x 400 x 350 |
| **Furnace weight (kg)** | 35 | 40 | 35 |
| **Tube length for use in air (mm)** | 690 | 940 | 390 |
| **Tube length for use with modified atmosphere (mm)** | 1225 | 1475 | 925 |
| **Control module dimensions H x W x D (mm)** | 500 x 550 x 700 | 850 x 550 x 700 | 500 x 550 x 700 |
| **Control module weight (kg)** | 50 | 60 | 50 |
| **Uniform length ±5°C (mm)** | 250 | 375 | 100 |
| **Power (kW)** | 3.6 | 5.4 | 2.1 |

| | FHA 13/80/500 | FHA 13/80/750 | FHA 13/80/1000 |
|---|---|---|---|
| **Number of heated zones** | 1 | 1 | 1 |
| **Max temp (°C)** | 1350 | 1350 | 1350 |
| **Furnace Ø (mm)** | 80 | 80 | 80 |
| **Heated length (mm)** | 500 | 750 | 1000 |
| **Furnace dimensions H x W x D (mm)** | 420 x 700 x 350 | 420 x 950 x 350 | 420 x 1200 x 350 |
| **Furnace weight (kg)** | 40 | 50 | 80 |
| **Tube length for use in air (mm)** | 690 | 940 | 1190 |
| **Tube length for use with modified atmosphere (mm)** | 1225 | 1475 | 1725 |
| **Control module dimensions H x W x D (mm)** | 500 x 550 x 700 | 850 x 550 x 700 | 850 x 550 x 700 |
| **Control module weight (kg)** | 60 | 70 | 90 |
| **Uniform length ±5°C (mm)** | 200 | 375 | 500 |
| **Power (kW)** | 5.2 | 7.8 | 10.4 |

| | FHA 13/110/500 | FHA 13/110/750 | FHA 13/110/1000 |
|---|---|---|---|
| **Number of heated zones** | 1 | 1 | 1 |
| **Max temp (°C)** | 1350 | 1350 | 1350 |
| **Furnace Ø (mm)** | 110 | 110 | 110 |
| **Heated length (mm)** | 500 | 750 | 1000 |
| **Furnace dimensions H x W x D (mm)** | 590 x 700 x 520 | 590 x 950 x 520 | 590 x 1200 x 520 |
| **Furnace weight (kg)** | 55 | 70 | 100 |
| **Tube length for use in air (mm)** | 690 | 940 | 1190 |
| **Tube length for use with modified atmosphere (mm)** | 1225 | 1475 | 1725 |
| **Control module dimensions H x W x D (mm)** | 850 x 550 x 700 | 850 x 550 x 700 | 1100 x 1200 x 700 |
| **Control module weight (kg)** | 70 | 90 | 90 |
| **Uniform length ±5°C (mm)** | 250 | 375 | 500 |
| **Power (kW)** | 7.8 | 11.5 | 16.0 |

| | FHA 13/110/1250 | FHC 13/32/500 | FHC 13/50/500 |
|---|---|---|---|
| **Number of heated zones** | 1 | 3 | 3 |
| **Max temp (°C)** | 1350 | 1350 | 1350 |
| **Furnace Ø (mm)** | 110 | 32 | 50 |
| **Heated length (mm)** | 1250 | 500 | 500 |
| **Furnace dimensions H x W x D (mm)** | 590 x 1450 x 520 | 420 x 700 x 350 | 420 x 700 x 350 |
| **Furnace weight (kg)** | 130 | 30 | 35 |
| **Tube length for use in air (mm)** | 1440 | 690 | 690 |
| **Tube length for use with modified atmosphere (mm)** | 1975 | 1225 | 1225 |
| **Control module dimensions H x W x D (mm)** | 1100 x 1200 x 700 | 500 x 550 x 700 | 500 x 550 x 700 |
| **Control module weight (kg)** | 90 | 50 | 50 |
| **Uniform length ±5°C (mm)** | 610 | 350 | 350 |
| **Power (kW)** | 20.0 | 2.4 | 3.6 |

| | FHC 13/50/750 | FHC 13/80/500 | FHC 13/80/750 |
|---|---|---|---|
| **Number of heated zones** | 3 | 3 | 3 |
| **Max temp (°C)** | 1350 | 1350 | 1350 |
| **Furnace Ø (mm)** | 50 | 80 | 80 |
| **Heated length (mm)** | 750 | 500 | 750 |
| **Furnace dimensions H x W x D (mm)** | 420 x 950 x 350 | 420 x 700 x 350 | 420 x 950 x 350 |
| **Furnace weight (kg)** | 40 | 40 | 50 |
| **Tube length for use in air (mm)** | 940 | 690 | 940 |
| **Tube length for use with modified atmosphere (mm)** | 1475 | 1225 | 1475 |
| **Control module dimensions H x W x D (mm)** | 850 x 550 x 700 | 500 x 550 x 700 | 850 x 550 x 700 |
| **Control module weight (kg)** | 60 | 60 | 70 |
| **Uniform length ±5°C (mm)** | 550 | 350 | 550 |
| **Power (kW)** | 5.4 | 5.2 | 7.8 |

| | FHC 13/80/1000 | FHC 13/110/500 | FHC 13/110/750 |
|---|---|---|---|
| **Number of heated zones** | 3 | 3 | 3 |
| **Max temp (°C)** | 1350 | 1350 | 1350 |
| **Furnace Ø (mm)** | 80 | 110 | 110 |
| **Heated length (mm)** | 1000 | 500 | 750 |
| **Furnace dimensions H x W x D (mm)** | 420 x 1200 x 350 | 590 x 700 x 520 | 590 x 950 x 520 |
| **Furnace weight (kg)** | 80 | 55 | 70 |
| **Tube length for use in air (mm)** | 1190 | 690 | 940 |
| **Tube length for use with modified atmosphere (mm)** | 1725 | 1225 | 1475 |
| **Control module dimensions H x W x D (mm)** | 850 x 550 x 700 | 850 x 550 x 700 | 850 x 550 x 700 |
| **Control module weight (kg)** | 90 | 70 | 90 |
| **Uniform length ±5°C (mm)** | 800 | 300 | 500 |
| **Power (kW)** | 10.4 | 7.8 | 11.5 |

| | FHC 13/110/1000 | FHC 13/110/1250 |
|---|---|---|
| **Number of heated zones** | 3 | 3 |
| **Max temp (°C)** | 1350 | 1350 |
| **Furnace Ø (mm)** | 110 | 110 |
| **Heated length (mm)** | 1000 | 1250 |
| **Furnace dimensions H x W x D (mm)** | 590 x 1200 x 520 | 590 x 1450 x 520 |
| **Furnace weight (kg)** | 100 | 130 |
| **Tube length for use in air (mm)** | 1190 | 1440 |
| **Tube length for use with modified atmosphere (mm)** | 1725 | 1975 |
| **Control module dimensions H x W x D (mm)** | 1100 x 1200 x 700 | 1100 x 1200 x 700 |
| **Control module weight (kg)** | 90 | 90 |
| **Uniform length ±5°C (mm)** | 750 | 950 |
| **Power (kW)** | 16.0 | 20.0 |

**Please note**

- Heat up rate when using a 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 need to be added
- Minimum uniform length in horizontal furnace with insulation plugs fi tted at 100 °C below max. temperature
- Power supply: a = 3 phase 380 - 415 V / b = 3 phase 480 V / c = 3 phase 200 - 210 V / d = 3 phase 220 - 240 V / e = 1 phase 220 - 240 V

**www.carbolite.com/fha**