



ANNEALING FURNACE

GLO

www.carbolite.com/products/annealing-furnaces/glo/

GLO**ANNEALING FURNACE**

The GLO annealing furnace features a vacuum tight retort with highly symmetric positioning of the heating elements. The heating elements are CrFeAl, also known as APM, and are embedded in the ceramic fibre insulation.

The GLO is often equipped with a vacuum pumping system to reduce the Oxygen levels prior to heat treatment. To ensure the lowest possible contamination levels, several cycles of vacuum and Nitrogen purging occur to create a pure atmosphere in the retort. Vacuum assisted cycling is far superior compared to simply flowing Nitrogen through the retort as the process creates a pure atmosphere faster and requires less Nitrogen. After Oxygen levels have been reduced, heat treatment begins under an inert atmosphere with a slight overpressure.

The highest possible temperature of the GLO annealing furnace is 1100°C for heat treatment with an atmosphere. The front door of the cylindrical retort can be heated if required. At the water cooled front door, the gas is purged inside the GLO. It is preheated by the radiation shields, which are inserted at the front. The GLO is provided with a rear port for the expulsion of any gaseous by-products generated during the process.



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OPERATING POSSIBILITIES

The GLO can be operated manually or with the use of an automated system. The furnace is available in sizes of 5, 10 (mobile version), 40, 75, 120, 260, 400, 550, 600, 850, 950 and 1300 litres. The retort is manufactured with temperature resistant steel alloy (1.4841). Other materials are available on request.

The annealing furnace may be operated with reactive gases such as Hydrogen, which requires appropriate safety technology. The Hydrogen safety system includes an automatic operating system with a Nitrogen flooding tank to detect and purge the system should any malfunctions be detected. All devices are SIL2 certified.

The furnaces have a compact, space saving design. The debinding package allows for debinding or pyrolysis processes to be carried out. Virtually no condensation occurs as the unit is equipped with an afterburner and heated gas outlet for strong outgassing applications.

The GLO can be equipped with a fast cooling system. The retort can be air cooled from the outside or purged with cold, inert gas.

The GLO furnace is also available in two alternative versions:

- | The **vertical VGLO** is loaded vertically and therefore provides a compact, space saving design.
- | The **mobile GLO** is a transportable, space-saving version for flexible use in different applications.

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APPLICATION EXAMPLES

Annealing, degassing, drying, glowing, hardening, pyrolysis, tempering, thermal debinding prior to sintering

GLO**STANDARD FEATURES**

- | Manual control
- | Gas tight retort made of 1.4841 (equals grade 314) stainless steel
- | Water cooled door with gas tight rubber sealing (water cooling must be provided at customer site)
- | Radiation shields
- | Gas control with manual control for a single inert gas, air or formation gas
- | Precisely controlled atmosphere with highest possible purity
- | Over-temperature protection (recommended to protect valuable contents & for unattended operation)

GLO**OPTIONS**

Specify these at time of order.

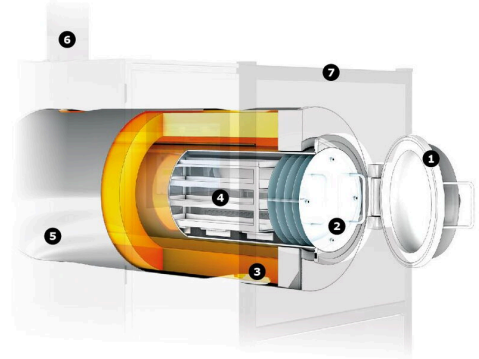
- | Vacuum System: pre-vacuum pump, roots pump, or turbomolecular pump
- | A range of sophisticated digital controllers, multisegment programmers and data loggers with digital communication options is available — more information about controllers: www.carbolite.com/products/control-options/
- | Reaction gas equipment for hydrogen concentrations larger than 4%
- | Chiller in case no water cooling is available on-site

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TECHNICAL DETAILS

VIEW INSIDE OF THE ANNEALING FURNACE

1. opened door
2. radiation shields
3. ceramic fiber insulation and heating elements
4. charging rack
5. thin metallic surrounding
6. afterburner
7. frame



The maximum temperature of the GLO annealing furnace is 1100°C. In this temperature range, heat is transmitted via a high amount of heat convection and conduction.

To ensure excellent temperature uniformity, the furnace is equipped with a gas circulation system by means of a ventilator located at the rear of the furnace, which ensures that the sample is surrounded by uniform inert gas at all times.

The sample specimen is placed on an engineered, horizontal charging rack with the incoming gases guided over the sample. Any gaseous by-products generated are immediately flushed out of the furnace.

A probe thermocouple is positioned at the rear of the furnace and in close proximity to the samples. The probe thermocouple serves as the control thermocouple for the two heating zones of the GLO, and simultaneously, monitors the temperature directly at the sample.

The heating elements are located outside of the retort. An over-temperature thermocouple is used for unattended operation. Further thermocouple probes can be integrated into the retort upon request.

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EXAMPLES



GLO 40/11



GLO 10/11-1G: Compact hot wall furnace with stainless steel retort and optional inonel retort (vacuum up to 750 °C and under normal pressure up to 1100 °C)



GLO 120/11-1G automatic up to 1100°C with optional hydrogen package and drawer door



GLO 40/11-1G semi-automatic up to 1100°C



VGLO Top Loader 10/11-1G manual up to 1100°C with optional vacuum pump (750°C max.)



VGLO - vertically mounted version of the GLO

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TECHNICAL DATA

Dimensions and weight are stated for the complete system; usable space is $\varnothing \times D$ in mm. Values shown as supplied for each model. Optional vacuum and cooling arrangements depend on the configuration.

GLO 10/11-1G

External H × W × D (mm)	1800 × 850 × 1600
Weight (kg) / volume (l)	500 / 10
Usable $\varnothing \times D$ (mm)	250 × 600
Tmax vacuum (°C)	900 (1.4841) / 1000 (Inconel)
Tmax atmospheric (°C)	900 / 1100
ΔT 300–1100°C (K)	± 5
Heat-up (K/min)	10
Cooling 1100–100°C (h)	18 natural / 2.5 forced
Power / voltage	14 kW / 400 V (3P)
Current / fuse (A)	3 × 25 / 3 × 32
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Water flow / inlet	1–3 l/min / 23°C
Nitrogen or Argon	200–2000 l/h
Manual / automatic	Eurotherm / Siemens

GLO 40/11-1G

External H × W × D (mm)	1900 × 1400 × 1800
Weight (kg) / volume (l)	1200 / 40
Usable $\varnothing \times D$ (mm)	310 × 600
Tmax vacuum (°C)	900 (1.4841) / 1000 (Inconel)
Tmax atmospheric (°C)	900 / 1100
ΔT / heat-up	± 5 K / 10 K/min
Power / voltage	25 kW / 400 V (3P)
Current / fuse (A)	3 × 63 / 3 × 80
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Water flow / inlet	1–3 l/min / 23°C
Nitrogen or Argon	200–2000 l/h
Manual / automatic	Eurotherm with KP 300 panel / Siemens
Extra value in source	13 natural / 2 forced

VGLO-TL 10/11-1G

External H × W × D (mm)	1600 (open) × 1400 × 850
Weight (kg) / volume (l)	500 / 10
Usable $\varnothing \times D$ (mm)	250 × 250
Tmax vacuum (°C)	600
Tmax atmospheric (°C)	900 / 1100
ΔT 300–1100°C (K)	± 5
Heat-up (K/min)	10
Power / voltage	14 kW / 400 V (3P)
Current / fuse (A)	3 × 25 / 3 × 32
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Water flow / inlet	1–3 l/min / 23°C
Nitrogen or Argon	200–2000 l/h
Manual / automatic	Eurotherm / Siemens
Extra value in source	4–5

GLO 75/11-1G

External H × W × D (mm)	2000 × 1600 × 1800
Weight (kg) / volume (l)	1500 / 75
Usable $\varnothing \times D$ (mm)	400 × 800
Tmax vacuum (°C)	800 (1.4841) / 900 (Inconel)
Tmax atmospheric (°C)	900 / 1100
ΔT / heat-up	± 5 K / 10 K/min
Power / voltage	40 kW / 400 V (3P)
Current / fuse (A)	3 × 110 / 3 × 160
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Water flow / inlet	1–3 l/min / 23°C
Nitrogen or Argon	200–2000 l/h
Manual / automatic	Eurotherm with KP 300 panel / Siemens
Extra value in source	7–9

GLO**TECHNICAL DATA****GLO 120/11-1G**

External H × W × D (mm)	2100 × 1800 × 2000
Weight (kg) / volume (l)	2000 / 120
Usable Ø × D (mm)	500 × 940
Tmax vacuum (°C)	700 (1.4841) / 800 (Inconel)
Tmax atmospheric (°C)	900 / 1100
ΔT / heat-up	± 5 K / 10 K/min
Power / voltage	60 kW / 400 V (3P)
Current / fuse (A)	3 × 67 / 3 × 80
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Water flow / inlet	5–10 l/min / 23°C
Nitrogen or Argon	200–3000 l/h
Manual / automatic	Eurotherm with KP 300 panel / Siemens
Extra value in source	17 natural / 4 forced

GLO 400/11-1G

External H × W × D (mm)	2300 × 2000 × 3500
Weight (kg) / volume (l)	3000 / 400
Usable Ø × D (mm)	640 × 1500
Tmax vacuum (°C)	600 (1.4841) / 750 (Inconel)
Tmax atmospheric (°C)	900 / 1100
Power (kW)	80
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Manual / automatic	Eurotherm Mini 8 / Siemens

GLO 260/11-1G

External H × W × D (mm)	2300 × 2000 × 2800
Weight (kg) / volume (l)	2500 / 260
Usable Ø × D (mm)	640 × 1100
Tmax vacuum (°C)	600 (1.4841) / 750 (Inconel)
Tmax atmospheric (°C)	900 / 1100
ΔT / heat-up	± 5 K / 10 K/min
Power / voltage	70 kW / 400 V (3P)
Current / fuse (A)	3 × 110 / 3 × 125
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Water flow / inlet	10–15 l/min / 23°C
Nitrogen or Argon	300–3000 l/h
Manual / automatic	Eurotherm Mini 8 / Siemens
Extra value in source	10–12

GLO 550/11-1G

External H × W × D (mm)	2300 × 2000 × 4000
Weight (kg) / volume (l)	3300 / 550
Usable Ø × D (mm)	640 × 2200
Tmax vacuum (°C)	600 (1.4841) / 750 (Inconel)
Tmax atmospheric (°C)	900 / 1100
Power (kW)	90
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Manual / automatic	Eurotherm Mini 8 / Siemens

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TECHNICAL DATA

GLO 600/11-1G

External H × W × D (mm)	2500 × 2300 × 3500
Weight (kg) / volume (l)	3800 / 600
Usable Ø × D (mm)	800 × 1800
Tmax vacuum (°C)	500 (1.4841)
Tmax atmospheric (°C)	900 / 1100
Power (kW)	95
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Manual / automatic	Eurotherm Mini 8 / Siemens

GLO 950/11-1G

External H × W × D (mm)	2600 × 2400 × 3500
Weight (kg) / volume (l)	4500 / 950
Usable Ø × D (mm)	1000 × 1700
Tmax vacuum (°C)	400 (1.4841)
Tmax atmospheric (°C)	900 / 1100
Power (kW)	110
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Manual / automatic	Eurotherm Mini 8 / Siemens

GLO 850/11-1G

External H × W × D (mm)	2500 × 2300 × 4000
Weight (kg) / volume (l)	4300 / 850
Usable Ø × D (mm)	800 × 2300
Tmax vacuum (°C)	500 (1.4841)
Tmax atmospheric (°C)	900 / 1100
Power (kW)	100
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Manual / automatic	Eurotherm Mini 8 / Siemens

GLO 1300/11-1G

External H × W × D (mm)	2600 × 2400 × 4000
Weight (kg) / volume (l)	5000 / 1300
Usable Ø × D (mm)	1000 × 2400
Tmax vacuum (°C)	400 (1.4841)
Tmax atmospheric (°C)	900 / 1100
Power (kW)	120
Leakage (mbar l/s)	< 5×10 ⁻³
Vacuum range	rough, fine or high vacuum
Manual / automatic	Eurotherm Mini 8 / Siemens

ΔT values are according to DIN 17052. Gas supply: Nitrogen or Argon; others on request. Values not listed for a model were left blank in the source table. The source table also lists some trailing values without a corresponding column heading; these are identified separately rather than assigned to a specification.

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