



FORNO DE LABORATÓRIO DE ALTA TEMPERATURA

HTF

carbolite.com/pt/produtos/fornos-de-camara/fornos-de-laboratorio/htf-high-temperature-chamber-furnaces/

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FORNO DE LABORATÓRIO DE ALTA TEMPERATURA

A linha de fornos de câmara Carbolite HTF é projetada para precisão e desempenho, oferecendo temperaturas de até 1800°C.

Esses fornos são ideais para uma variedade de processos, incluindo sinterização, recozimento, calcinação e outros tratamentos térmicos. Cada unidade da linha HTF é construída com materiais de alta qualidade e incorpora tecnologia térmica avançada para garantir distribuição uniforme de calor, controle de temperatura ideal e desempenho duradouro.

Seja você envolvido em pesquisa e desenvolvimento, controle de qualidade ou produção em setores como cerâmica, metalurgia, eletrônica ou ciência dos materiais, a linha de fornos de câmara HTF foi projetada para atender às suas necessidades específicas. Com foco na operação fácil, segurança e eficiência, esses fornos são equipados com controles intuitivos, recursos de segurança robustos e capacidades de economia de energia.



VISÃO GERAL

Temp. Máx.: 1700, 1800°C

Termopar de controle: Type B

Configuração: Montado em bancada: 4, 5, 8 & 10 litre; Floor standing: 27, 64, 128, 165 litre

Volume útil do forno: 1700°C: 5, 10, 27, 64, 128, 165 litre; 1800°C: 4, 8, 27, 64, 128, 165 litre

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TECNOLOGIA DE AQUECIMENTO DE PONTA

A linha de fornos HTF da Carbolite está no auge do design de fornos. É o resultado de mais de 80 anos de experiência em engenharia térmica, combinando os mais recentes avanços tecnológicos com uma construção sólida e componentes de alta qualidade.

ELEMENTO DE AQUECIMENTO

- | Excelente uniformidade de temperatura
- | Rápidas taxas de aquecimento e resfriamento
- | Uniformidade de temperatura insuperável

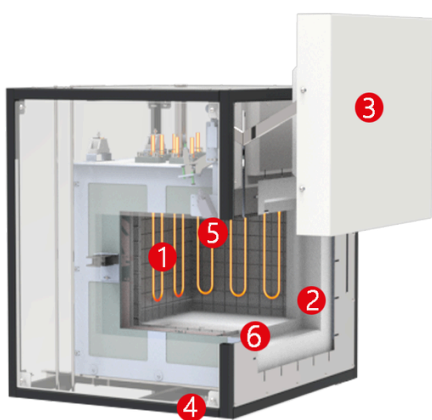
ISOLAMENTO TÉRMICO DE ALTA QUALIDADE

- | Baixo consumo de energia
- | Baixa temperatura externa do gabinete
- | Projetado para longa vida útil

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INSIDE HTF CHAMBER FURNACES

View inside the 1700 °C and 1800 °C HTF chamber furnace:



1. Heating elements (MoSi₂)
2. Ceramic fibre insulation
3. Front door
4. Supporting frame
5. Thermocouple
6. Usable space

MoSi₂ U-shaped heating elements are installed in a vertical, hanging position within the HTF. The heat is insulated using ceramic fiber boards, layered with an appropriate thickness to enhance temperature uniformity. The maximum temperature of these boards is chosen based on the furnace's maximum temperature requirements. Water cooling is unnecessary due to the low thermal conductivity of the insulation material. The system is externally cooled by ambient air convection within the outer case.

MoSi₂ heating elements are ideal for high-temperature processes, as they naturally form a protective oxide layer at elevated temperatures. The HTF chamber furnace is distinguished by its exceptional temperature uniformity and compact design.

HTF CHAMBER FURNACES

FEATURES & OPTIONS

The HTF high temperature furnace range comprises 1700 °C and 1800 °C models. Os quatro modelos menores são montados em bancada e as unidades maiores são de piso. Esses fornos podem ser personalizados para atender a requisitos específicos do cliente, como a adição de opções de debinding para aplicações de queima de ligantes cerâmicos.

STANDARD FEATURES

- | 1700°C & 1800°C maximum operating temperature
- | Com capacidades de 4 a 165 litros
- | High quality molybdenum disilicide heating elements
- | Vertical lift door keeps heated surface away from the user
- | Manual door operation on the 4 to 10 litre models
- | Electrical door actuation on the 27 to 165 litre models
- | Advanced refractory interior, used in combination with energy efficient low thermal mass insulation
- | Programmable EPC3016P1 controller
- | Over-temperature protection
- | Ethernet communications
- | Resfriamento por ventilador para baixa temperatura externa do gabinete
- | Motorised exhaust vent

OPTIONS

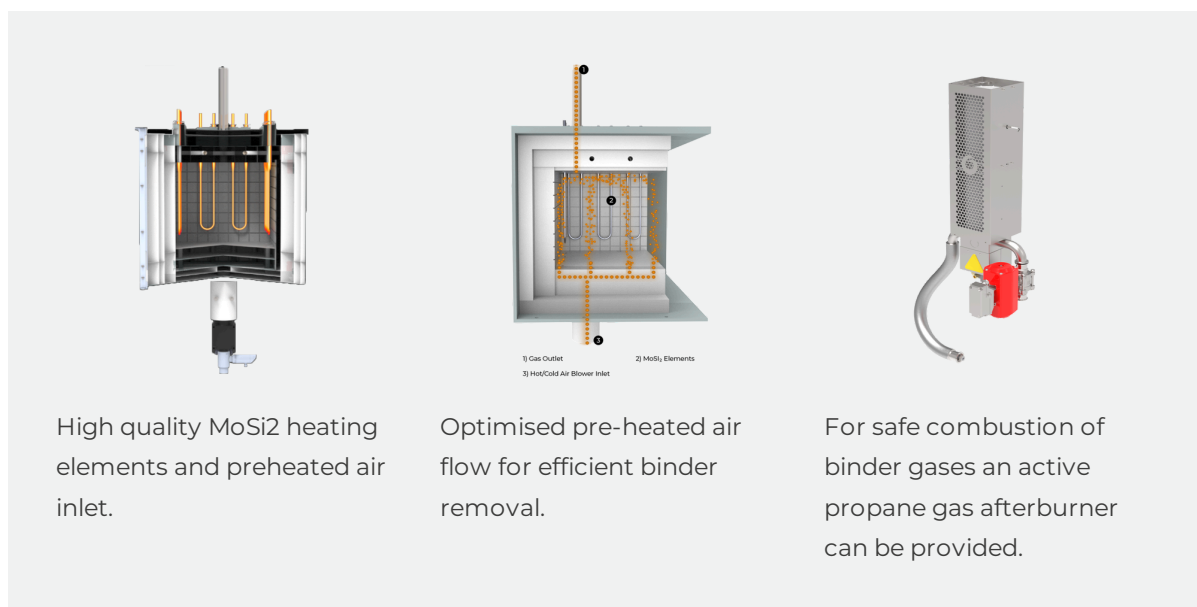
- | A range of sophisticated digital controllers, multisegment programmers and data loggers with digital communication options is available
- | Inert gas inlet
- | 100mm flowmeter for inert gas
- | Solenoid valve with manual switch
- | Solenoid valve with automatic switch
- | Fast cooling comprising an air blower and utilising the standard motorised exhaust vent
- | Debinding and sintering with pre-heated air flow
- | Debinding and sintering with pre-heated air flow and gas flame after burner
- | Sheathed thermocouple calibration port
- | Unsheathed thermocouple calibration port through back wall of chamber (Ø 12 mm)
- | Unsheathed thermocouple calibration port through centre of door (Ø 12 mm)

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DEBINDING & SINTERING

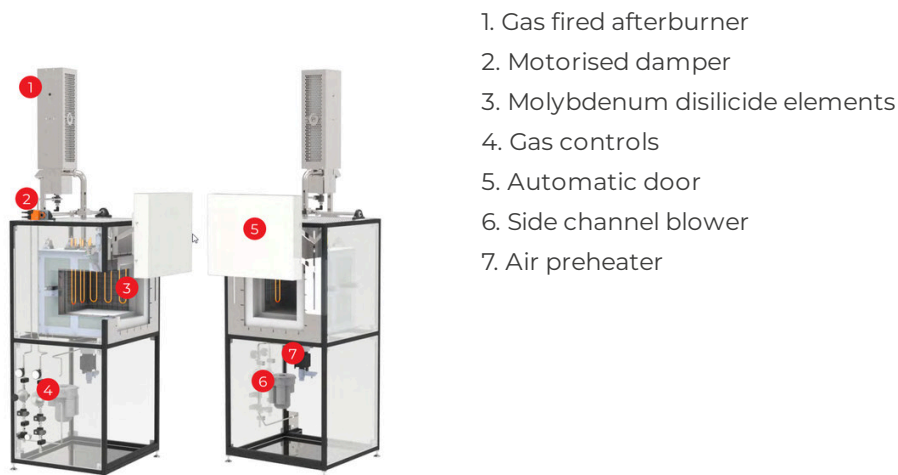
Carbolite HTF furnaces may be equipped with debinding and sintering options to accommodate a range of technical ceramic applications. A thermally induced decomposition and evaporation of the binder occurs due to gas flow through the HTF furnace during the debinding phase. The gas flow guides vapours to leave the sample.

The sintering of oxide ceramics in an HTF 1700°C or 1800°C furnace is a critical process in materials engineering, essential for achieving optimal mechanical and structural properties in ceramic components. This high-temperature sintering, particularly relevant for materials like alumina and zirconia, optimizes microstructural characteristics, enhancing performance in demanding applications.



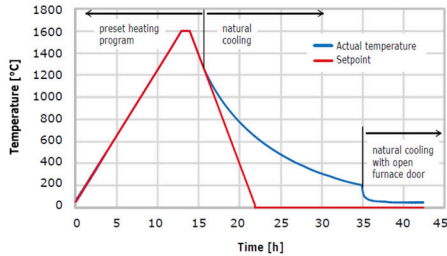
OPTIONAL DEBINDING AND SINTERING WITH PRE-HEATED AIR FLOW AND GAS FLAME AFTER BURNER

HTF PART IDENTIFICATION



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SINTER RUN IN HTF 18/64



Disclaimer: The information presented shows typical performance. Furnace load ~ 8kg.

Loading: The ceramic is placed on a sintering tray in the HTF furnace, using a tray that withstands high temperatures without reacting with the ceramic.

Ramp-Up: The furnace's temperature is methodically increased to 1800°C, with a controlled profile to prevent thermal shock and ensure even heating, possibly pausing at certain temperatures for stress relief.

Soak: At 1800°C, the ceramic undergoes a critical soak, allowing particles to merge through diffusion, enhancing density and growth.

Cool Down: Following the soak, the furnace cools to room temperature at a rate that prevents thermal stress, avoiding cracks or deformation in the ceramic.

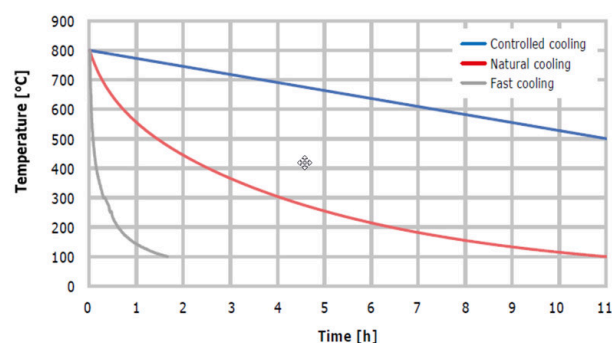
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COOLING OPTIONS

The cool down phase in sintering oxide ceramics is crucial for maintaining structural integrity and achieving desired properties. By utilising the HTF furnace's pre-heated air inlet blower options the user gains flexibility for their sintering processes. This feature allows precise control of cooling from sintering temperatures (1700 or 1800°C) to room temperature, preventing thermal gradients and associated stresses that could damage the ceramic.

For complex shapes or materials prone to thermal shock, step cooling can be used. With the HTF furnace step cooling can be optimised to minimize thermal stress risks by holding at intermediate temperatures to equalize internal and external temperatures. The HTF furnace can be used to tailor the cool down to each ceramic's needs, ensuring high-quality components with optimal properties.

COOL DOWN RATES FOR HTF 17/430



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TEMPERATURE UNIFORMITY

The HTF furnaces ensures exceptional temperature uniformity with its advanced design, high-quality elements, and superior thermal insulation for minimal heat loss and even heat distribution.

Advantages of investing in a Carbolite furnace:

- | Efficient removal of binder due to a high airflow
- | Great temperature uniformity at low temperatures due to the air pre-heater
- | Safe handling of binder by using the thermal afterburner
- | Unique uniformity at high temperatures due to an optimized heating element arrangement
- | Air blowers can be used for fast cooling to minimize run times

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CONTROLE DE TEMPERATURA & COMUNICAÇÕES

HTF furnaces are equipped with ethernet communications and a programmable controller with 24 segments as standard:

- | Single zone furnaces fitted with Carbolite EPC3016P1 controller
- | Over-temperature protection to protect valuable contents and for unattended operation

OPÇÕES

- | A range of sophisticated digital controllers, multi-segment programmers and data loggers is available.



Controlador de Tela Sensível ao Toque Aries Plus

HTF DEBINDING & SINTERING

CERÂMICAS TÉCNICAS

Os processos de debinding e sinterização são necessários para remover o aglutinante orgânico e para densificar os componentes cerâmicos.

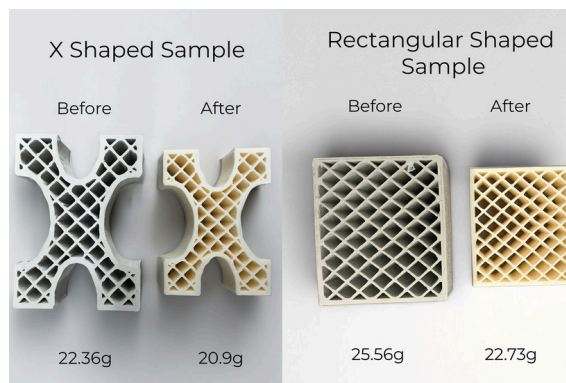
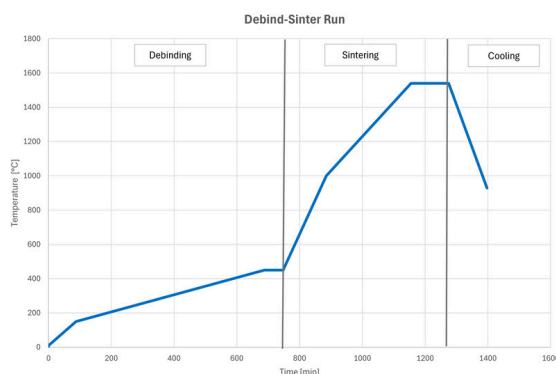
- | Efficient debinding
- | Densification of parts
- | Uniform shrinkage

MAIS INFORMAÇÕES → carbolite.com/pt/aplicacoes/ceramica-tecnica/

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DEBINDING & SINTERIZAÇÃO USANDO HTF

During the heat treatment process, the 3D-printed components were treated in the same furnace. The X-shaped sample experienced a weight loss of approximately 6.5%, while the rectangular-shaped sample showed a weight loss of about 11.1%.



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LABORATORY AND INDUSTRIAL OVENS — FAQ

WHAT MAKES THE 1700 & 1800°C CHAMBER FURNACE RANGE IDEAL FOR THERMAL TREATMENTS?

The 1700 & 1800°C furnace range, designed for precision and performance, excels in processes like sintering, annealing, and calcination. Built with top-notch materials and incorporating advanced thermal technology, it ensures uniform heat distribution, optimal temperature control, and durability. Ideal for sectors such as ceramics, metallurgy, and electronics, it meets diverse research, quality control, and production needs.

CAN 1700 & 1800°C CHAMBER FURNACES BE CUSTOMIZED FOR SPECIFIC APPLICATIONS?

1700 & 1800°C furnaces offer customization for specific requirements, including debinding options for ceramic binder burn-off. Available in both bench-mounted and floor-standing models, each furnace can be tailored for precise technical needs, providing flexibility and precision for various applications.

HOW DOES THE 1700 & 1800°C FURNACE RANGE ENSURE TEMPERATURE UNIFORMITY AND EFFICIENCY?

Com elementos de aquecimento de dissiliceto de molibdênio de alta qualidade e isolamento térmico avançado, a linha de fornos alcança excelente uniformidade de temperatura, rápidas taxas de aquecimento e resfriamento, além de reduzir o consumo de energia. Esses componentes contribuem para a eficiência e capacidade de aquecimento consistente dos fornos, garantindo baixas temperaturas externas e longa vida útil.

HOW DO 1700 & 1800°C CHAMBER FURNACES ACCOMMODATE DEBINDING AND SINTERING PROCESSES?

Equipped with debinding and sintering options, including pre-heated air flow and gas flame afterburners, these furnaces support thermal decomposition and evaporation of binders during debinding.

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DADOS TÉCNICOS · MODELOS 1700°C

Especificação	HTF 17/5	HTF 17/10	HTF 17/27	HTF 17/64
Temp. Máx. (°C)	1700	1700	1700	1700
Tempo de aquecimento (minutos)	50	44	--	--
Dimensões: Interno A x C x P (mm)	158 x 150 x 225	232 x 200 x 225	300 x 300 x 300	400 x 400 x 400
Dimensões: Externo A x L x P (mm); A porta aberta	565 x 830 x 650 (850)	565 x 830 x 650 (850)	1835 x 900 x 1000 (1950)	2530 x 1150 x 1490
Configuração	Bancada	Bancada	Floor standing	Floor standing
Volume (litros)	5	10	27	64
Potência máx. (W)	4050	5920	10000	16000
Digital Ethernet Comms	Padrão	Padrão	Padrão	Padrão
Tipo de termopar	B	B	B	B
peso (kg)	109	133	355	555

CONFIGURAÇÃO

Os quatro modelos menores são montados em bancada e as unidades maiores são de piso. Esses fornos podem ser personalizados para atender a requisitos específicos do cliente, como a adição de opções de debinding para aplicações de queima de ligantes cerâmicos.

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DADOS TÉCNICOS · MODELOS 1800°C

Especificação	HTF 18/4	HTF 18/8	HTF 18/27	HTF 18/64
Temp. Máx. (°C)	1800	1800	1800	1800
Tempo de aquecimento (minutos)	65	56	--	--
Dimensões: Interno A x C x P (mm)	140 x 140 x 190	210 x 190 x 190	300 x 300 x 300	400 x 400 x 400
Dimensões: Externo A x L x P (mm); A porta aberta	565 x 830 x 650 (850)	565 x 830 x 650 (850)	1835 x 900 x 1000 (1950)	2530 x 1150 x 1490
Configuração	Bancada	Bancada	Floor standing	Floor standing
Volume (litros)	4	8	27	64
Potência máx. (W)	4650	6200	10000	16000
Digital Ethernet Comms	Padrão	Padrão	Standard	Standard
Tipo de termopar	Pt20%Rh/ Pt40%Rh	Pt20%Rh/ Pt40%Rh	B	B
peso (kg)	115	128	355	555

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DOWNLOADS

FICHA TÉCNICA DO PRODUTO HTF LABORATORY FURNACE →

carbolite.com/files/451851/ficha-tecnica-do-produto-htf-laboratory-furnace.pdf

GLO / HB / HTF / HTK / LHTG / V-L PRODUCTS CATALOGUE →

carbolite.com/files/442984/glo-hb-htf-htk-lhtg-v-l-products-catalogue.pdf

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CONTATO

carbolite.com/pt/contact-services/contact-form/?prefilltext=contact_form.request&product=C-3-UCF-B

SOLICITAÇÃO DE ORÇAMENTO

carbolite.com/pt/contact-services/contact-form/?prefilltext=contact_form.quote_request&product=C-3-UCF-B



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