

## Heat Treatment of Metals and Ceramics

### SOLUTIONS FOR ADDITIVE MANUFACTURING & POWDER INJECTION MOLDING

- \_ Powder Bed and Inkjet Head 3D-Printing
- \_ Direct Metal Laser Sintering (DMLS)
- \_ Ceramic Injection Molding (CIM)
- \_ Metal Injection Molding (MIM)
- \_ Fused Filament Fabrication (FFF)
- \_ Fused Deposition Modeling (FDM)
- \_ Digital Light Processing (DLP)
- \_ Selective Laser Melting (SLM)
- \_ Stereo Lithography (SLA)
- \_ Material Extrusion
- \_ Multi-Material AM
- \_ Powder Bed Fusion
- \_ Binder Jetting
- \_ Powder Metallurgy
- \_ Robocasting

## Stress relieving of laser sintered parts with hot wall inert gas retort furnaces



Carbolite Gero GPCMA/174

### Advantages

- Stress relieving of laser printed metal parts
- Up to 700°C (HTMA)
- Up to 1200°C (GPCMA)
- Reactive gas atmosphere  $\geq 800^\circ\text{C}$  (hydrogen)
- Inert gas atmosphere (argon or nitrogen)
- Highest temperature uniformity
- Oxygen content can be reduced to 30 ppm
- Optional compliance to AMS2750E Nadcap

### APPLICABLE FOR METALS

Selective Laser Melting (SLM)  
 Direct Laser Metal Sintering (DMLS)  
 and many others

### Selection of available hot wall inert gas retort furnaces

Model	Dimensions: Internal retort H x W x D [mm]	Model	Dimensions: Internal retort H x W x D [mm]
GPCMA/37	205 x 337 x 538	GPCMA/208	428 x 500 x 970
GPCMA/56	229 x 400 x 610	GPCMA/245	650 x 700 x 1050
GPCMA/117	279 x 500 x 840	HTMA 7/95	455 x 455 x 455
GPCMA/174	428 x 500 x 815	HTMA 7/220	610 x 610 x 610

For details please refer to our catalogues or enquire directly

## Sintering of metals with cold wall vacuum chamber furnaces



**APPLICABLE FOR METALS**  
 Material Extrusion (FFF/FDM)  
 Stereo Lithography (SLA)  
 Digital Light Processing (DLP)  
 Binder Jetting  
 and many others

Carbolite Gero HTK 8

### Advantages

- Debinding and sintering of metal parts
- Up to 1450°C (higher available)
- Inert gas atmosphere (argon or nitrogen)
- Highest temperature uniformity
- Reactive gas atmosphere (e.g. 100% hydrogen for 316L)
- High vacuum (e.g. turbo pumps for titanium)
- Remaining binder (backbone binder) removal

### Selection of available cold wall vacuum chamber furnaces

Model Top loader	Dimensions: Internal retort Ø x H [mm]	Model Front loader	Dimensions: Internal retort H x W x D [mm]
LHTM 100-100	90 x 100	HTK 8	190 x 170 x 200
LHTM 100-200	90 x 190	HTK 25	250 x 250 x 400
LHTM 200-300	190 x 290	HTK 80	400 x 400 x 500

For details please refer to our catalogues or enquire directly

## Process development for multiple applications with tube furnaces



Carbolite Gero HTRV 18/100/500

## Advantages

- Debinding and sintering of metal or ceramic parts
- Various sizes and temperatures available
- Various tube materials available (e.g. quartz glass, mullite, RCA)
- Up to 1500°C under vacuum
- Up to 1800°C under inert gas or hydrogen
- Very small footprint
- Horizontal or vertical tube



Carbolite Gero HZS 12/600

## Selection of available tube furnaces

Model	Temperature [°C]	Dimensions: Work tube inner Ø [mm]	Model	Temperature [°C]	Dimensions: Work tube inner Ø [mm]
<b>E-Range</b>	up to 1200	up to 50	<b>F-Range</b>	up to 1350	up to 180
<b>G-Range</b>	up to 1200	up to 150	<b>STF-Range</b>	up to 1600	up to 75
<b>K-Range</b>	up to 1200	up to 180	<b>HTRH-Range</b>	up to 1800	up to 88

For details please refer to our catalogues or enquire directly

## Heat treatment of ceramics with high temperature chamber furnaces



**APPLICABLE FOR CERAMICS**

- Material Extrusion (FFF/FDM)
- Stereo Lithography (SLA)
- Digital Light Processing (DLP)
- Binder Jetting
- and many others

Carbolite Gero HTF 17/5

Carbolite Gero HB 18/80

### Advantages

- Debinding and sintering of ceramic parts
- Works on air
- Very small footprint
- Up to 1800 °C on air
- Highest temperature uniformity
- Remaining binder (backbone binder) removal

### Selection of available high temperature chamber furnaces

Model	Dimensions: Internal H x W x D [mm]
<b>HTF 18/4</b>	140 x 140 x 190
<b>HTF 18/8</b>	210 x 190 x 190
<b>HTF 18/27</b>	300 x 300 x 300
<b>HTF 18/64</b>	400 x 400 x 400
<b>HTF 18/165</b>	550 x 550 x 550

Model	Dimensions: Internal H x W x D [mm]
<b>HTF 18/250</b>	500 x 500 x 1000
<b>HTF 18/332</b>	550 x 550 x 1100
<b>HTF 18/514</b>	780 x 550 x 1200
<b>HB 18/80</b>	500 x 400 x 400
<b>HB 18/240</b>	500 x 1200 x 400

For details please refer to our catalogues or enquire directly

## Catalytic or thermal debinding with inert gas furnaces



Carbolite Gero EBO 120

### Advantages

- Thermal debinding up to 1100°C (GLO range)
- Catalytic debinding up to 150°C (EBO range)
- Inert gas control
- Safe afterburner combustion
- Nitric acid control for catalytic debinding

### APPLICABLE FOR METALS & CERAMICS

Material Extrusion (FFF/FDM)  
 Stereo Lithography (SLA)  
 Digital Light Processing (DLP)  
 Binder Jetting  
 and many others

### Selection of available inert gas debinding furnaces

Model	Dimensions: Internal H x W x D [mm]	Model	Dimensions: Internal H x W x D [mm]
<b>EBO 40</b>	300 x 300 x 450	<b>GLO 10</b>	170 x 170 x 300
<b>EBO 120</b>	400 x 400 x 750	<b>GLO 40</b>	210 x 210 x 600
<b>EBO 250</b>	500 x 500 x 1000	<b>GLO 120</b>	320 x 320 x 700
<b>GLO 5</b>	110 x 100 x 250	<b>GLO 260</b>	420 x 420 x 800

For details please refer to our catalogues or enquire directly

## Drying of parts after solvent or water debinding with forced convection ovens



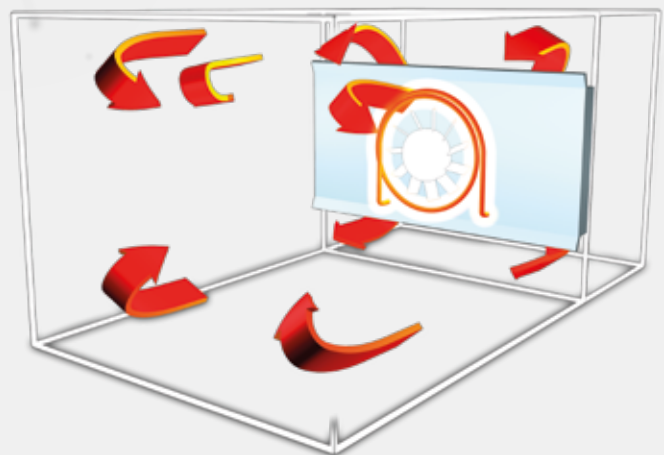
**APPLICABLE FOR METALS & CERAMICS**

Thermal or Catalytic Binder Feedstock and many others

Carbolite Gero PF 30 with moisture extraction option and optional window

### Advantages

- Removal of water or organic solvents
- 300°C as standard (higher available)
- Forced convection for highest uniformity
- Works on air
- Exhaust fans
- Optional compliance to DIN EN 1539 for solvents
- Optional compliance to AMS2750E Nadcap



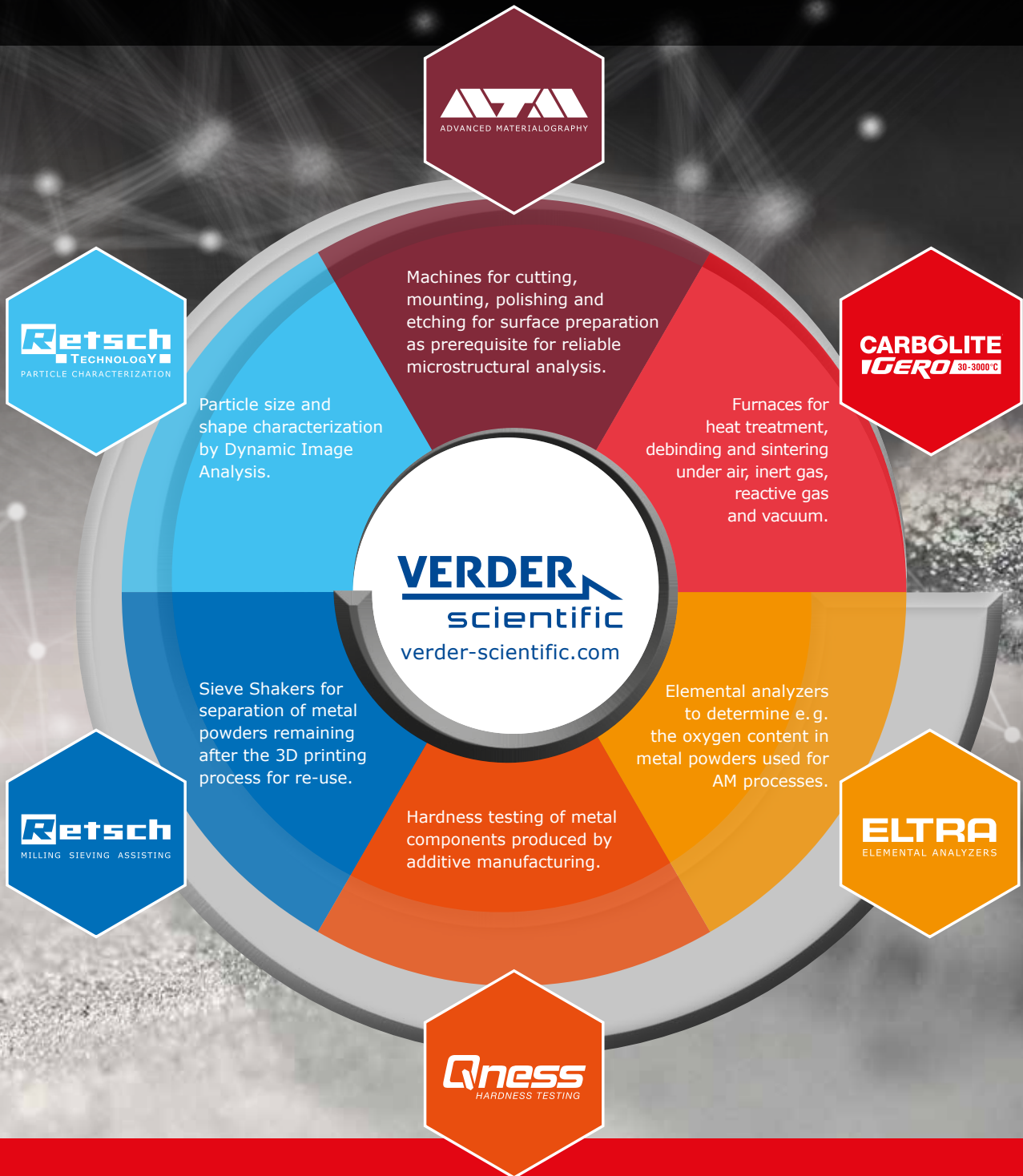
### Selection of available forced convection ovens

Model	Dimensions: Internal H x W x D [mm]	Model	Dimensions: Internal H x W x D [mm]
PF 30	300 x 290 x 320	PF 400	1500 x 605 x 510
PF 60	400 x 390 x 420	GP 220A	610 x 610 x 610
PF 120	500 x 490 x 520	GP 330A	915 x 610 x 610
PF 200	750 x 590 x 520	GP 450A	1220 x 610 x 610

For details please refer to our catalogues or enquire directly

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