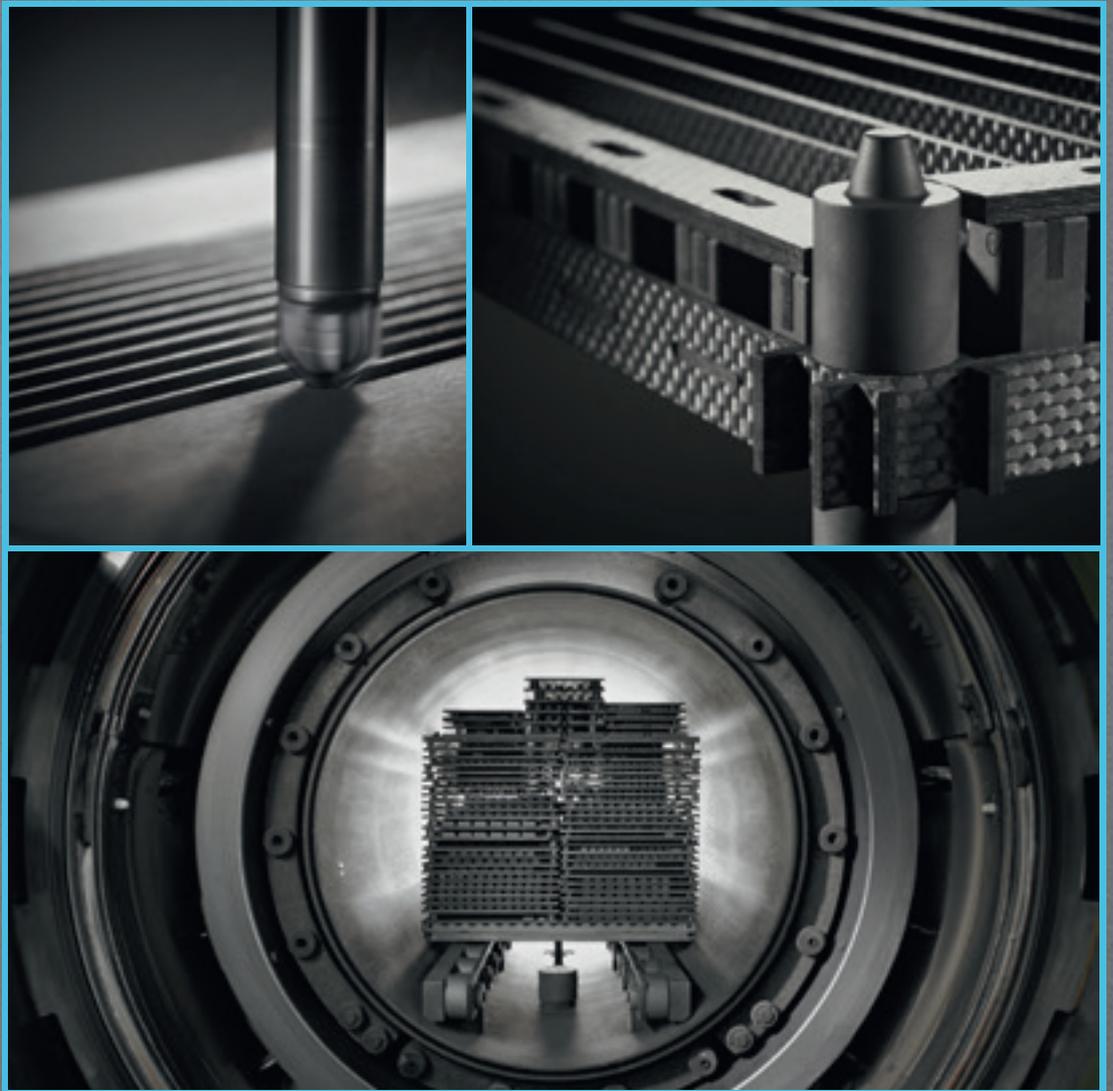


System Solutions

for high-temperature applications



From the idea to the finished component.



Lightweight. Stable. Temperature resistant.

Graphite Materials recognizes the tremendous potential of the element carbon. And enthusiastically gets it into shape.

It's up to you to decide what shape this will be. We are driven by your individual needs. These give us direction and point the way to the best solution for you with maximum benefit for your application.

Each of our employees is totally committed to this. From the initial idea to the finished component. From the dimensionally-stable CFC fixtures to the customized heating system. From piece production to large-scale manufacture. Quality in every fiber.

This begins with the use of materials that have undergone exhaustive testing, includes a precise design and culminates in effective manufacture according to the highest quality standards. Everything under one roof – everything from one stop. Always listening to you and taking your requirements into account. True to our guiding principle: we are only satisfied when you are.

This is the standard by which we are measured.

Kind regards, Dr.-Ing. Rolf Terjung

Graphite Materials.

Your partner for the best that carbon has to offer.



In the heart of the metropolitan region of Nuremberg:

- 3000 m² production area
- 30 employees
- Founded in 2000
- Owner-managed, independent company
- LEAN production management
- Sustainable environmental management ISO 14001:2015
- QM system 9001:2015
- Training is the future

Carbon is life:

Materials for the highest requirements.

C. The third letter of the alphabet. The symbol for the element carbon. And everything we are passionate about.

Carbon is the key component of life. It is present in more chemical compounds than any other element. The human body is also largely made up of carbon: Carbon accounts for two thirds of our body. In the case of employees of Graphite Materials, it could even be a bit more ...

Carbon is not only the basis of our everyday work. It is also the beginning of the evolutionary process of two materials that Graphite Materials daily transforms into individual customer solutions: Graphite and CFC.

↑ The lead of a pencil is an everyday example of the use of graphite.

In eight steps: How graphite is formed



1. Two raw materials are needed to produce synthetic graphite: **Petroleum coke** as filler and **coal tar pitch** as binding agent.

2. When the raw materials have been tested for their **suitability for graphite production**, the petroleum coke is **calcined, ground** into particles and collected in a container.

3. The resulting coke particles are mixed with pitch and **some trace additives** in a heated installation. As they cool, they solidify to form beads.

4. These beads are then crushed and milled into a fine dust using a **pulverizing process**.

5. The "flour" is subject to a **rough screening operation** if all particles have not have been fully pulverized. At this point, the final graphite grade is determined.

6. The screened mixture of petroleum coke and pitch is **pressed** in a large container (isostatic press) at pressures up to 1400 bar. The press molding tool determines the shape and size of the extruded graphite semi-finished products.

7. The pressed graphite parts are known as "**green**" **billets**, even though they are black. They are "**baked**" at **temperatures of about 1000 degrees Celsius** in large, electronically-controlled furnaces.

8. The last and crucial step in the manufacturing process is **graphitizing**. The carbon billets are **heated to temperatures of about 3000 degrees Celsius**. During this process, **small crystal seeds form** that realign into larger hexagonal structures. This is synthetic graphite.

Pure, robust, dimensionally stable: Graphite

Graphite is a naturally occurring stable modification of carbon. On closer examination, graphite is seen to have a hexagonal crystal lattice. This is made up of superimposed, flat carbon layers and is what gives graphite its typical crystalline structure. It has outstanding properties for industrial use.

Graphite offers **excellent thermal and electrical conductivity**. This makes it ideal for use in heating systems, for example, for melting metallic silicon for the production of semiconductor components or photovoltaic systems. Furthermore, graphite is an ideal construction material for support plates and forming tools when pressure-sintering hard metals and diamond tools. Its **mechanical strength increases greatly with a rising temperature up to about 2500 degrees Celsius**. As machining graphite is quite straightforward, it can be used for almost all component geometries. On the strength of its purity, it is also suitable as a material for the manufacture of crucibles and memory chips.

Graphite exists in two states: solid and gaseous. For this reason, under anaerobic conditions, graphite components offer **extreme dimensional stability and are ideal for high-temperature applications** up to 2500 degrees Celsius.



↑ Three-part crucible



↑ CFC pipe

Lightweight, durable, resistant: CFC

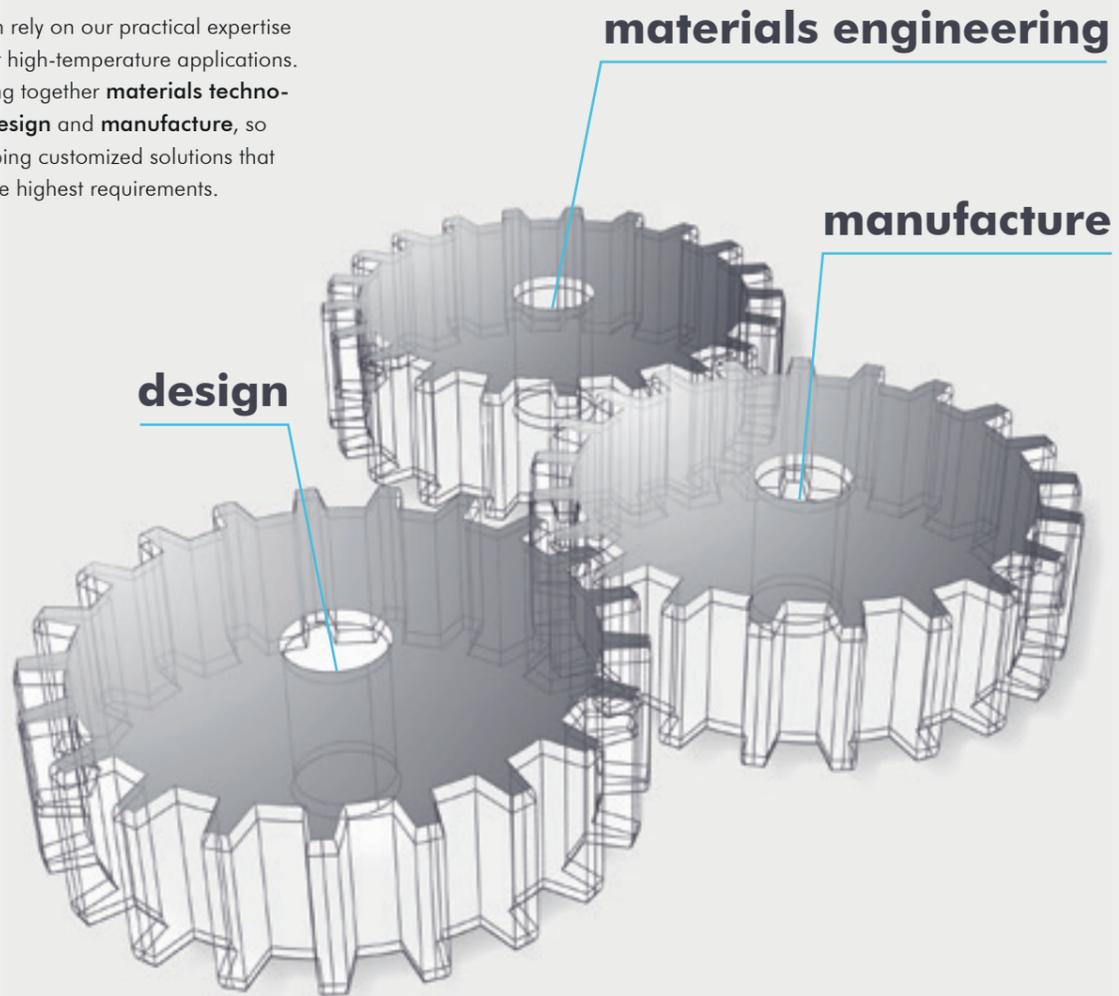
Carbon fiber reinforced carbon – quality in every fiber. The development of CFC started in the 1960s and was driven by the material requirements of aerospace engineering.

The principle of CFC: Carbon is greatly reinforced by carbon fiber. This creates a **highly stable material with extraordinary properties**. Unlike components made of pure carbon, CFC elements are **impact-resistant** and **break-proof**. CFC is lightweight, rigid and thermally-stable (in anaerobic conditions). Typical application temperatures of CFC are between 1000 and 2000 degrees Celsius. The low thermal expansion of CFC ensures **outstanding dimensional stability**. As CFC is now widely used in industry, new machining strategies and reliable calculation methods continue to be developed.

These facilitate the construction of even complex components and their practical application can be realistically simulated. CFC – an ideal construction material for high-temperature applications. With an extra shot of creative freedom.

Lots of questions, one solution: Graphite Materials.

You can rely on our practical expertise for your high-temperature applications. We bring together **materials technology, design** and **manufacture**, so developing customized solutions that meet the highest requirements.



Creative partner for high-temperature applications

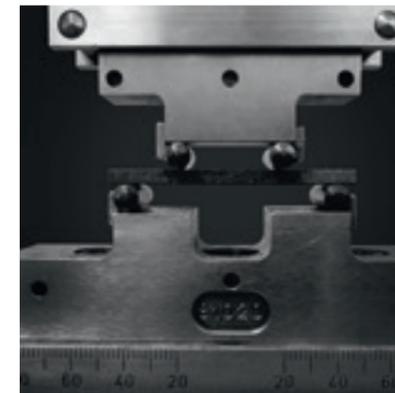
Graphite Materials is your equal partner for high-temperature applications in the range from 1000 degrees Celsius. We manufacture high-quality components from graphite and CFC, which are used in systems in a wide variety of different industries. From the robust special screw in series production to the complex CFC cylinder in piece production.

Our work is always centered on your individual requirements. Our employees include you in the planning and manufacturing process from the start and translate your wishes into tangible solutions. Creativity meets quality. In materials engineering, design and manufacture.



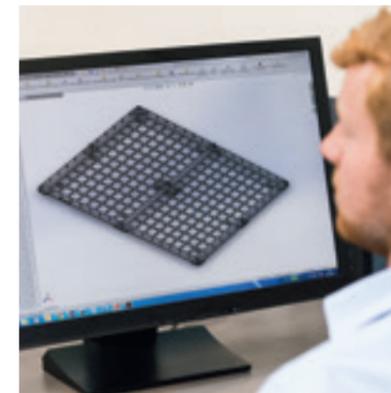
↑ Multi-layer CFC fixture in use

Materials engineering



No compromises: We only use the best materials in our products. Our materials engineering specialists measure and analyze, simulate and experiment.

Manufacture



Spot-on solutions: Each of your wishes encourages our creative lateral thinkers to new heights. We offer you modern and effective solutions. Transparent and practical.

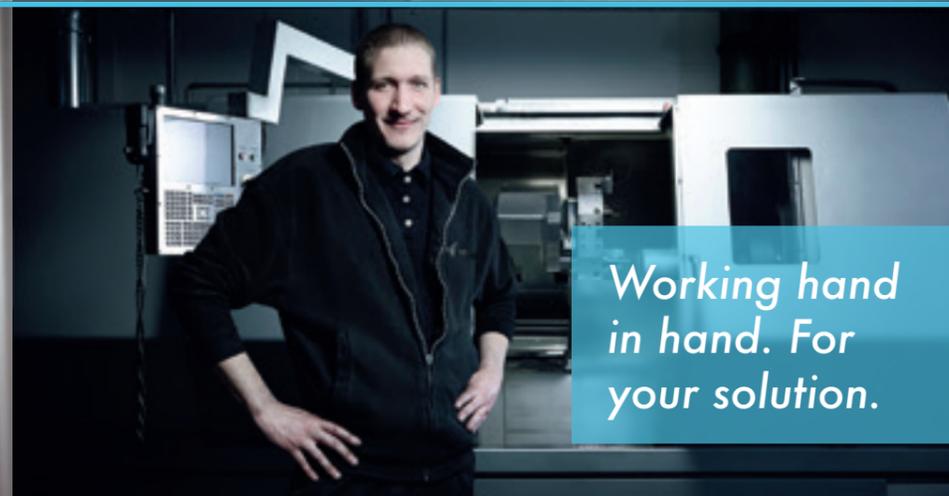
Design



Putting designs through their paces: Our manufacture is not just an extended workbench mindlessly producing one piece after another. It is the heart of Graphite Materials, kept in sync by skilled workers who use their initiative, always with a focus on customer benefit.



*Good ideas.
Optimum components.*



*Working hand
in hand. For
your solution.*



Performance-driven.

Starting into the future: New ideas for your industry.



↑ heat treatment

Graphite Materials is your reliable partner when things hot up. More than 500 customers around the world are already benefiting from our effective solutions for high-temperature applications. With our innovative ideas, we bring a new impetus into a wide variety of different industries.

For example, Graphite Materials manufactures CFC fixtures for the automotive and the aviation industries. However, our high-quality insulation cylinders, sintering trays and roller conveyors are used in powder metallurgy. Furnace construction is also in good hands with us: Our heating systems, thermal insulation and roller conveyors epitomize top quality. We offer impressive products for heat treatment applications, such as charging systems for metal components and insulation linings.



↑ steel industry



↑ automotive industry



Graphite Materials:

- We design and manufacture exclusively in Germany
- We manufacture all parts in our own production facilities
- We respond promptly to your requirements
- We deliver quickly and seamlessly
- We always hold capacities in reserve for emergencies (people, machines and materials)
- We develop special solutions with you to meet your individual requirements
- We provide project support from the idea to the finished component
- If requested, we will assemble your system or component on site

Our services at a glance:

- Processing of individual parts, as well as small series and mass production
- Manufacture of assemblies (for example, heating systems)
- Design and layout of components and systems
- Simulation of mechanical and thermal load cases
- Heating chamber servicing (dismantling, installation, commissioning)
- Spare parts service

There's a piece of Graphite Materials in almost every industry.

Here is a selection of our products:



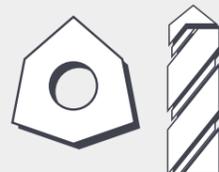
Automotive

- CFC fixtures for gearwheels
- Steering pinions and clutch shafts



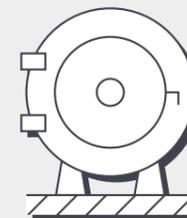
Aviation

- CFC fixture for turbine blades and landing flap mechanisms



Powder metal and ceramics

- Insulation cylinders
- Sintering trays
- Loading systems for tools
- Powder crucibles



Furnace construction

- Thermal insulation
- Heating systems
- Susceptors
- Roller conveyors
- Support beams



Heat treatment

- Loading systems for metal components
- Insulation linings
- Heating systems
- Fastening systems
- Edge protection (U-profiles and L-profiles)



CVD coating

- Graphite and CFC loading system (rings and discs)
- Preheat chambers
- Hard felt insulation
- Graphite foil
- Gas pipe

QUALITY MEANS MORE



from the **idea** to the finished **component**

Graphite Materials thinks ahead. As a system supplier, we not only offer you inspiring ideas but also clear added value – at every stage of our collaboration:

1.

Consultation

Always at your service: Your personal contact at Graphite Materials will be pleased to hear from you. We take the time to give you comprehensive, individual and transparent advice. With our modern ERP system, we control all business processes to ensure they are perfectly aligned. In this way, we ensure that your orders are processed quickly and economically.

2.

Materials engineering

Experienced and inquiring: Which material is suitable for your application? What are the strengths and weaknesses of the different materials? We help you to choose the best material for your application. This results in tested material combinations, such as our DuComGrid® for high-temperature applications.

3.

Design

Resourceful: We have pragmatic ideas for designing products that function perfectly in everyday use. Visual models at the design stage give you an idea of how your finished product will actually look. We are passionate about finding the best solution and creating customized products for your application area. Cost-aware, with state-of-the-art technology and optimum benefit.

4.

Manufacture

Modern and motivated: Manufacture at Graphite Materials is characterized by state-of-the-art CNC machines, high-quality tools and a committed team. Thanks to flat hierarchies and little red tape, we respond quickly and flexibly to your requirements. Our employees continue to expand their knowledge. Graphite Materials brings together vertical integration and an extensive range of services with professional and effective lean production management.

5.

Logistics

Intelligent packaging: Our Logistics department no longer dispatches our products in cardboard boxes with polystyrene fillers but in robust wooden crates. These are easier to stack and store and protect against light, dirt and moisture. The lids of the crates are screwed down rather than nailed. This makes them easy to open and, if necessary, re-close. Damage caused by crowbars and similar implements is a thing of the past.

6.

After-sales service

Service-oriented: As part of our after-sales service, we continue to talk to you about a product's performance. Are you satisfied with it? Do you need support? Is there now an effective enhancement for your product? We'll also be happy to support you by visiting you on site, for example, for training, inspections and servicing. Thanks to online documentation, we respond quickly when you need a specific replacement part.



**YOUR ORDER –
OUR SOLUTION**

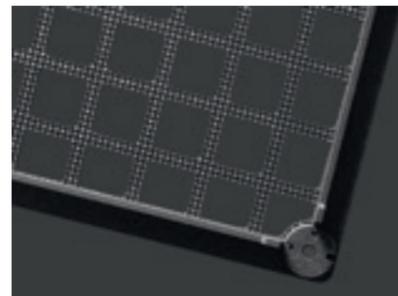
CFC fixtures

Lightweight. Stable. Durable.
Fixtures also for extreme conditions.

CFC fixtures by Graphite Materials withstand heat of up to 1300 °C, tremendous temperature fluctuations and a high weight load – and still stay in shape. This makes them the ideal workpiece fixture for use in heat treatment, for example, when hardening metallic components, such as rings, gearwheels and shafts.



↑ Our charging plates are designed to match your component geometry

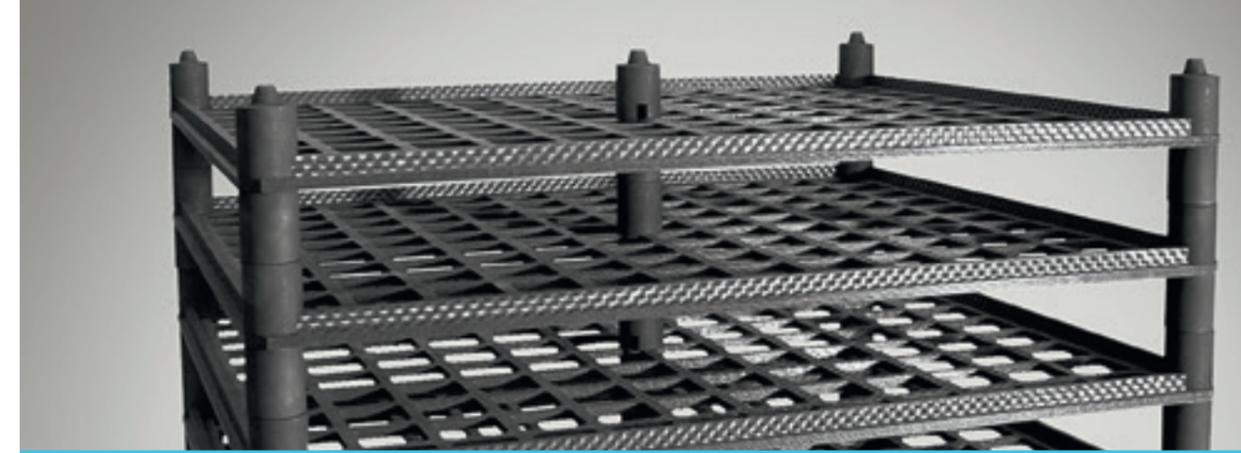


↑ Workpiece fixture with optimized surface structure

As tough as it comes: CFC

As hard as steel? That's not hard enough for us. So we make our carrier frames of **CFC** (carbon-fiber-reinforced carbon). CFC has a multi-layer structure and was first developed for aviation and space flight. It is also an outstanding construction material in manufacture.

CFC fixtures by Graphite Materials are used in case hardening via **surface carburizing**, **case hardening with oil quenching** and in **structure adjustments** and **soldering processes**. They boast an impressive array of positive material properties. CFC fixtures are at least five times lighter than those made of steel – and yet much stronger. Carbon fiber materials even increase in strength with a rise in temperature. Whilst steel distorts or deforms at high temperatures, **CFC fixtures retain their shape**. This makes them **predictable** and **the components placed on them are protected against unwanted changes**. In addition, CFC carrier systems are **resistant to the effects of chemicals** and **extremely durable**: When used correctly, CFC fixtures by Graphite Materials last for **ten years** or more.



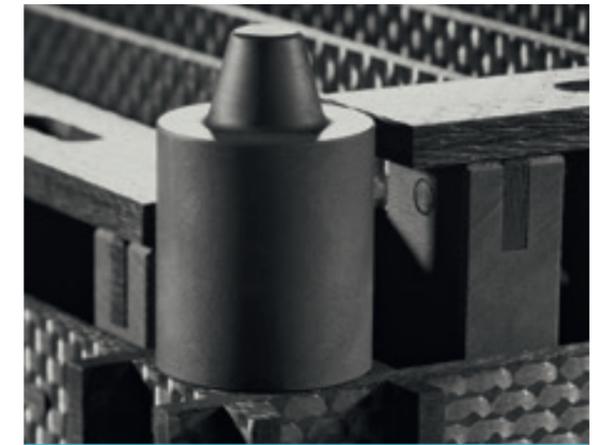
↑ Uniform heating and cooling thanks to customized design

Customized to your needs

The workpiece supports of the CFC fixtures by Graphite Materials are ideally adjusted to the geometry of your components. The customized design ensures an optimum air flow around your products during heat treatment and, at the same time, uniform heating and cooling. The result: Components with only minimum reproducible shape and dimensional deviations after hardening. With our specialist knowledge and experience, we manufacture CFC fixtures that you can put to practical use on an everyday basis. We also take account of whether the fixture is loaded manually or automatically (lifting truck or conveying system).

Coding and individualization

Smart fixtures for smart users: Individual coding of our CFC fixtures for process control and maintenance ensures maximum process safety, plannable downtimes and clear identification.



↑ Thanks to the specially adapted conical posts, the individual fixture levels can be angled. This simplifies the process cycle and prevents accidental damage.

Five times lighter than steel fixtures – and yet much stronger.



Maximum resistance to high weight loading

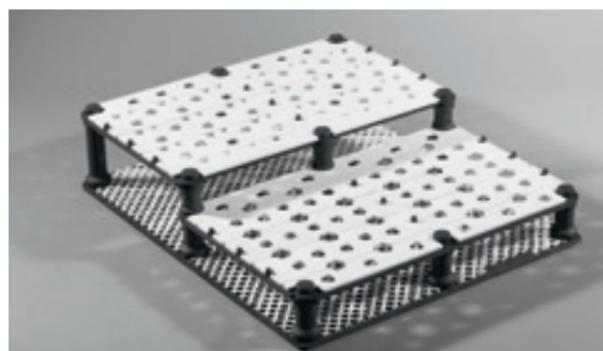
Robust and dimensionally stable – this also applies to CFC fixtures loaded with heavy components. Graphite Materials manufactures carrier systems for forming tools with a weight of up to five tons.



↑ CFC workpiece fixtures for gas carburizing with oil quenching, stackable.

Advantages of CFC fixtures for your manufacture:

- + Lightweight:** 60 to 90 percent weight reduction compared with metallic fixtures
- + Easy:** Customized for manual or automatic loading
- + Durable:** Service life of ten years or more
- + Resistant:** Withstand chemical influences
- + Effective:** Clear energy savings compared with metallic fixtures
- + Plannable:** Reliable processes thanks to reproducible, minimal distortions
- + Cost-saving:** Higher added value thanks to reduced process times and higher packing density



↑ DuComGrid®: CFC with ceramic modules

DuComGrid®: Two are better than one

Temperatures up to 1325 degrees Celsius? For particularly hot applications, Graphite Materials relies on its innovative **DuComGrid®** combining two or more different materials for your carrier system. For example, CFC is either coated or supplemented with ceramic or refractory metal. There is no risk of contact reactions between metallic workpieces and CFC fixtures.

Applications of CFC fixtures:

- Case hardening via surface carburizing up to 1050 °C (low-pressure carburizing with high-pressure gas quenching)
- Case hardening with oil quenching
- Structure adjustments and soldering processes up to 1300 °C
- Heat treatment under vacuum or in oxygen-free inert atmospheres

Your contact person:



Eduard Lassel
Head of construction
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For different designs, spacings and stacking heights:



↑ HS steel billets



↑ Turbine blades



↑ Gearwheels

Powder metal and ceramic

Safe. Precise. Energy-saving.

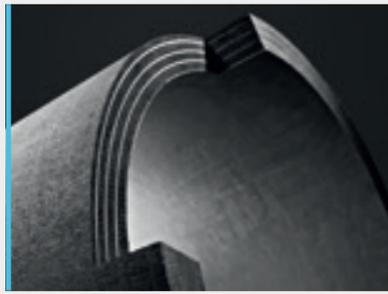
Ideal systems for your sintering process.

You control the process – we supply the system. True to this motto, Graphite Materials has been manufacturing high-quality products for powder metallurgy shaping for many years. With our system solutions, you benefit from all the advantages of the sintering process for semi-finished and finished parts.

Graphite Materials manufactures the following components as single parts or system solutions for your sintering process:

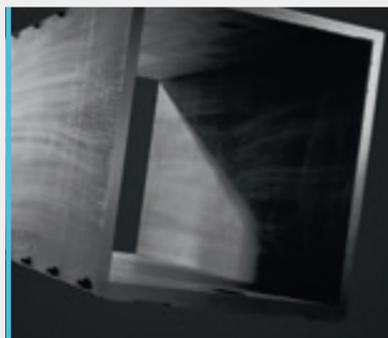
Insulation cylinders and insulation panels (rectangular chamber):

Insulation cylinders and insulation panels from Graphite Materials ensure a uniform furnace temperature, which is ideal for your sintering process. In addition, integrated foils prevent convective heat transfer during pressure-sintering. CFC surfaces on the internal and external diameter of the cylinder offer additional protection and stability.



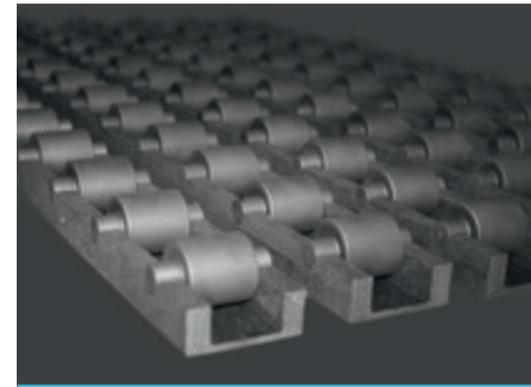
Heating systems (heating elements and tubes; current bridges):

Efficient heating systems made of graphite and CFC operate reliably and uniformly, delivering the necessary heat for successful sintering. Graphite Materials calculates the individual heating elements in accordance with your requirements, so ensuring a low-loss energy flow.



Susceptors and muffles:

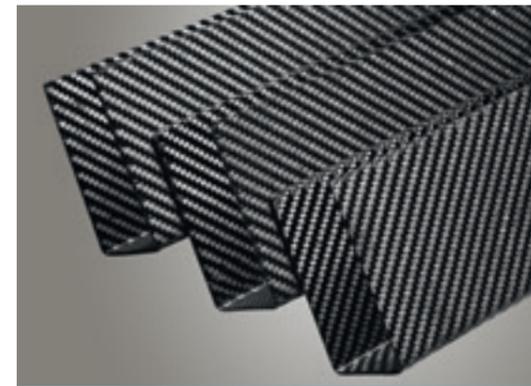
Susceptors and muffles from Graphite Materials protect the sinter from external influences, such as direct thermal radiation from the heating elements. They heat up themselves and emit their heat uniformly to the workpieces. Local overheating (so-called hot spots) is avoided.



Roller conveyors and track systems:

Load-bearing roller conveyors and track systems safely load and unload your sintering facility. Graphite Materials only selects the very best materials for your components. We then manufacture our extremely stable and functional roller conveyors and track systems based on exact calculations.

You control the process – we supply the system.



Edge and surface protection (CFC elements and coating):

Sintering processes release chemical compounds that vaporize at different temperatures and condense again. Contact reactions with the insulation and the graphite and CFC components in your system are unavoidable. For this reason, we recommend you rely on effective edge and surface solutions from Graphite Materials for the long-term protection of your components.

Advantages of the sintering process with components from Graphite Materials:

- + Accurate:** High dimensional accuracy with large piece numbers
- + Lightweight:** Ten to 15 percent lower weight than solid material
- + Flexible:** Wide variety of different material combinations thanks to freely selectable powder mixes
- + Efficient:** No processing waste



Charging plates and spacers:

Unsintered components are very fragile. So Graphite Materials recommends you use precisely manufactured support plates with near-net-shape profiles and the finest tolerances.

Your contact person:



Roland Weeske

Head of Business Unit Specialty Graphite
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Robust. Reliable. Efficient. High-tech finishes for your products.

Give your products additional functions with CVD coatings. Graphite Materials supports you with customized graphite, CFC and insulation components for your coating system.

CVD stands for chemical vapor deposition. This is an effective process for coating components via a thermally induced chemical reaction. In simple terms: Gas in a coating system flows around your components and gets into even the smallest of contours. At temperatures of about 1000 °C, a thin and uniform protective layer comprising nitrides, carbides, borides and oxides is applied.

We help you create new disc profiles.

So you can also apply an optimum coating to components with a complex shape.



Technical edge thanks to CVD

CVD coatings offer outstanding adhesion, even under extreme operating conditions. This results in homogeneous components without weak spots.

Create a technical edge with a CVD coating and improve the quality of your products. Graphite Materials produces high-quality, customized components for your coating system. We rely on tried-and-tested graphite, CFC and insulation materials that we process with precision.

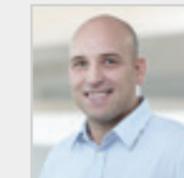
Why CFC for the CVD coating?

Space costs money. Also in CVD coating. This is why Graphite Materials offers you extremely slim workpiece fixtures made of CFC (carbon fiber carbon composite). They are less than half the thickness of graphite plates and yet carry the same weight of components. For example, a four-millimeter-thick CFC plate has the same load-bearing capacity as a ten-millimeter-thick graphite plate. So you can increase the number of charging levels in your system and coat many more components in a process cycle. The advantage of CFC rings and plates over graphite is that they can also be de-coated, re-used and re-coated. This saves material, energy and, in turn, also costs.

Advantages of CFC rings and plates for the coating:

- + **Higher added value** with each coating cycle
- + **Lower consumption** of resources (material, energy)
- + **Lower costs** for operating resources
- + **Low expansion** (minimizes the risk of flaking)
- + **High dimensional stability**
- + **High load-bearing capacity**

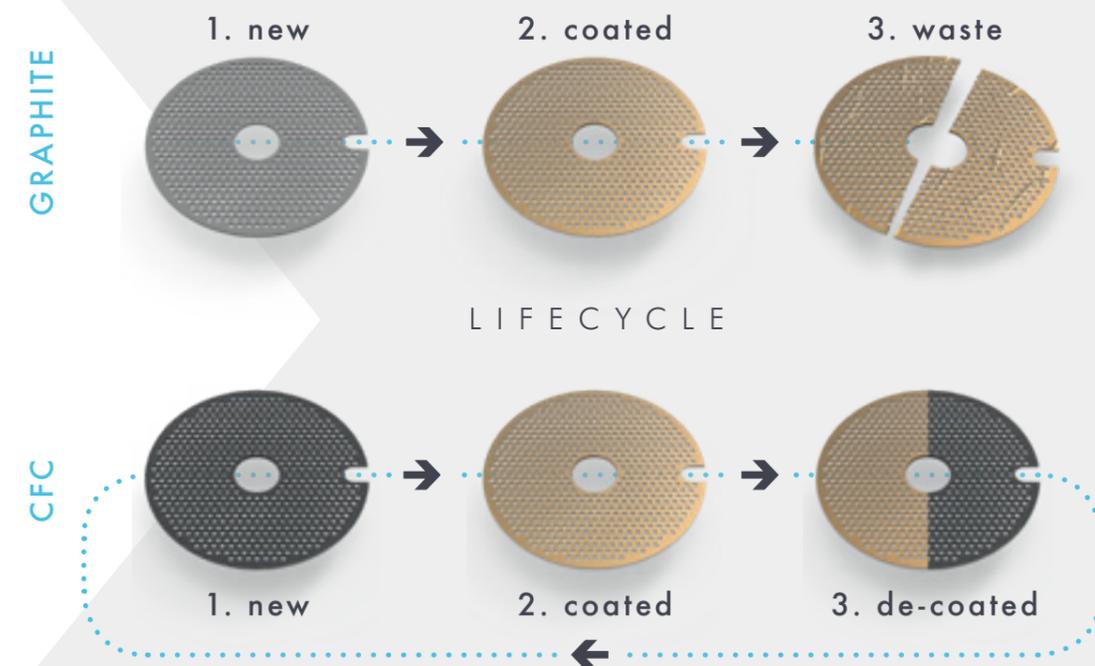
Your contact person:



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Sustainability and greater added value with Graphite Materials



Heating chamber linings and repairs

Reliable. Durable. Efficient. Maximum performance for your vacuum, inert-gas and sintering furnaces.

Get the most out of your industrial furnaces with Graphite Materials. From **technical support** and the **development** of graphite and CFC heating systems to professional **heating chamber lining and repair**: Graphite Materials provides quick and straightforward support.

Professional servicing for reliable furnaces

Your industrial furnaces work with maximum efficiency, day after day. This takes its toll: Insulation wears out, heater elements break, steel cages become distorted. Often just when your customer is in urgent need of the product. Don't lose any time: **Graphite Materials provides quick and straightforward assistance and gets your vacuum, inert-gas and sintering furnace up and running again.** Generally within eight days.

As practical experts, we know what really matters to you: Reliable furnaces that work efficiently. So we only use **high-quality, tested materials** to line your heating chamber. For example, **insulation with high thermal insulation, moisture-repellent for short pumping times.** This increases the efficiency of your heating chamber, so ensuring a long service life.

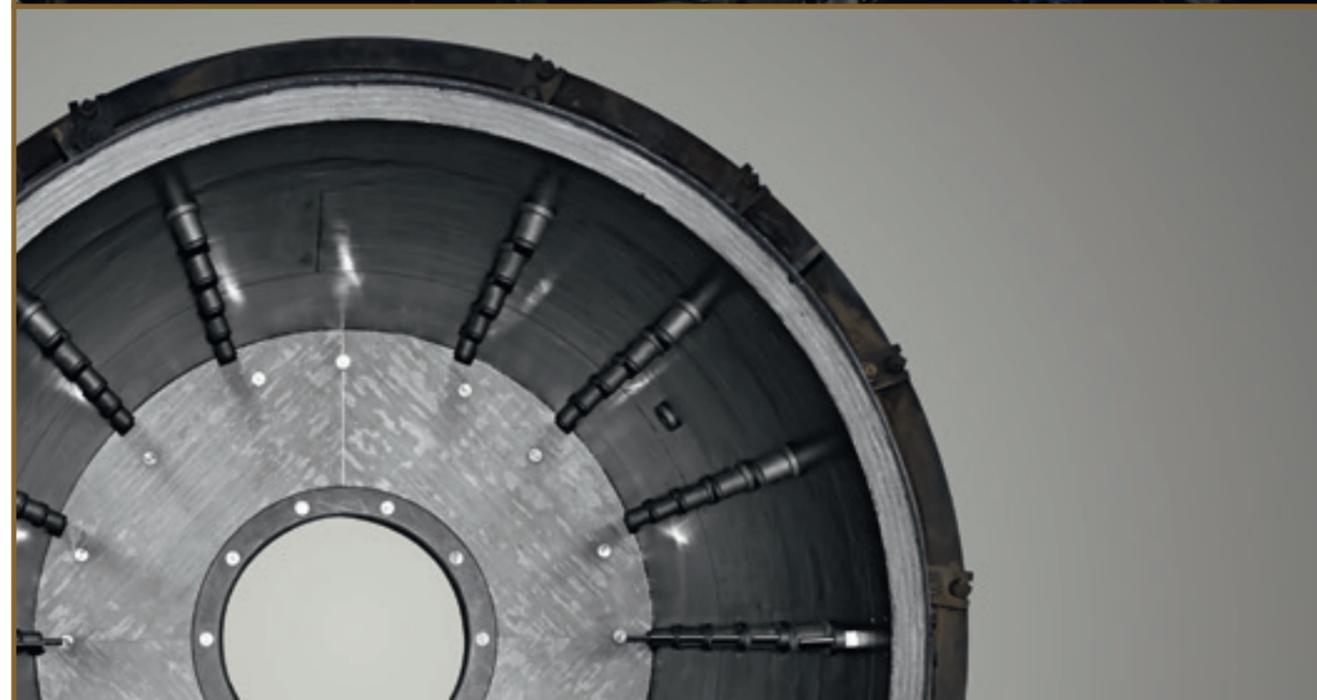
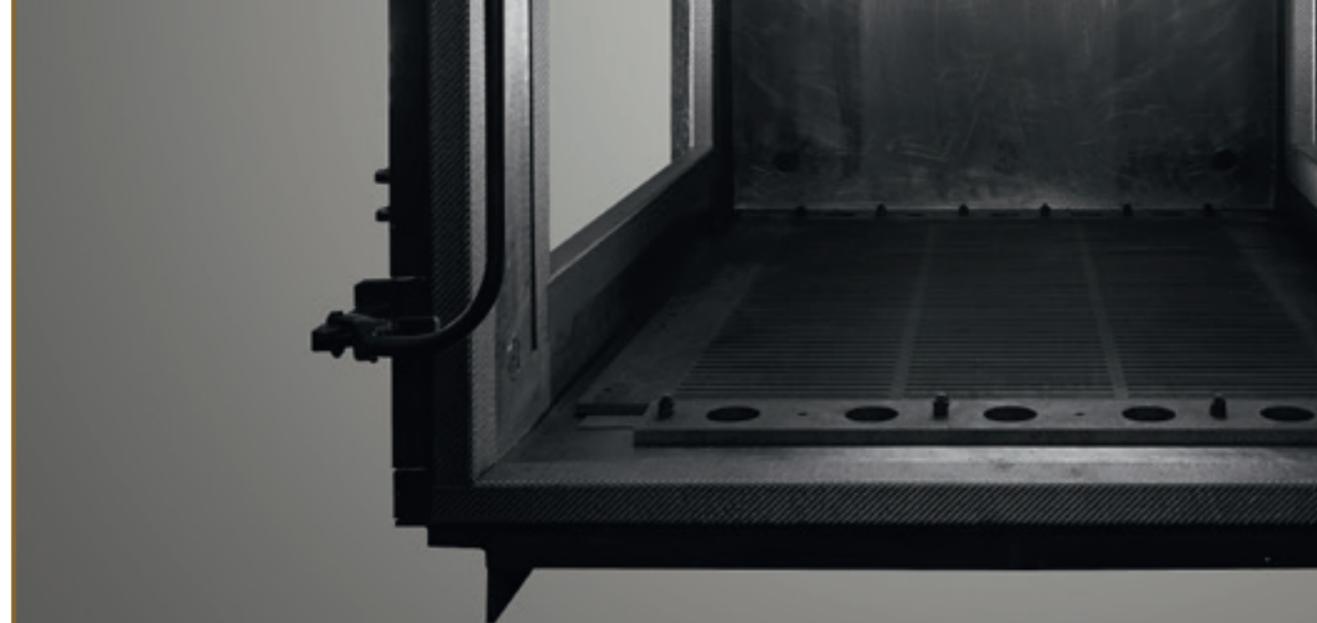
On request, our comprehensive service also includes **collecting your heating chamber and returning it to you** after servicing. Of course, we will also be happy to support you on site with commissioning.

Spare parts service: Maximum quality, quick delivery

Short waiting times, no delivery bottlenecks: **Graphite Materials replaces defective parts in your industrial furnace within 24 hours.** Our employees manufacture each spare part in top quality to meet your individual requirements. From the broken special screw to the worn muffle. All it takes is a phone call and we will find the optimum solution for you. Quickly and reliably.

Optimization and engineering for excellent manufacture

No adventures in manufacture: **Reduce the risk of production downtimes and optimize the performance of your industrial furnace.** Graphite Materials is your competent partner for increasing the service life and energy efficiency of your system and for finding customized solutions. Of course, this is all based on the very latest engineering expertise. A phone call that pays off.



Advantages of our heating-chamber services for your manufacture:

- + Fast:** Servicing within eight days, delivery of spare parts generally within 24 hours
- + Individual:** Repair and manufacture according to your needs
- + Durable:** High-quality, tested materials for a long service life
- + Effective:** Optimization and engineering for maximum performance
- + Safe:** Reduction of production downtimes
- + Personal:** The right contact person with just one phone call
- + Uncomplicated:** Service from the first phone call to commissioning

Our heating-chamber services at a glance:

- Servicing of vacuum, inert-gas and sintering furnaces, incl. cleaning and disposal of the old components
- Steel chamber construction or repair
- Partial disaster recovery
- Technical support for furnace insulation made of carbon fiber with a focus on durability, performance and energy efficiency
- Development and production of graphite and CFC heating systems in accordance with mechanical and thermal requirements
- FEM calculation for mechanical and thermal load cases
- Manufacture of high-quality, customized spare parts, generally within 24 hours

Your contact person:



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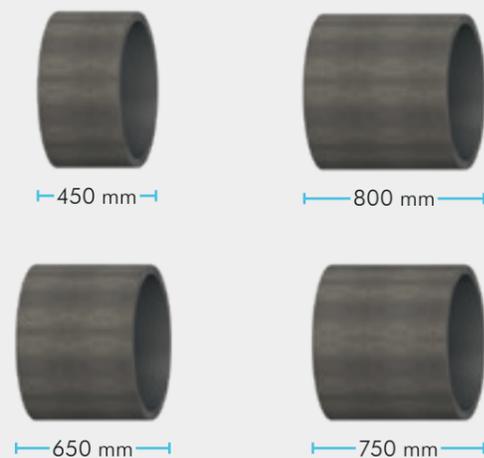
Modular. Precise. Variable in length. Insulation cylinders for greater efficiency.

Optimize your heat treatment and save energy and costs. Insulation cylinders from Graphite Materials are the ideal solution for effective heating chambers. We have more than 20 years' practical experience with insulation cylinders. We manufacture felt insulation for pressure-sintering plants, gas-quenching and vacuum furnaces. We cooperate with the innovative Japanese company KUREHA, which develops extremely high-quality and energy-saving felt.

Precise flexibility thanks to modular construction

Insulation cylinders from Graphite Materials have a modular design. The basic modules are available in four standard sizes and we machine them to meet your requirements. They are then assembled and/or bonded. This modular concept enables maximum flexibility and customized concepts. Any length is possible. Outer diameters range from dia 400 to 2000 millimeters.

Each individual module is manufactured with modern CNC-controlled machines. This enables the maximum reproducibility of the insulation properties.



There are lots of reasons for the extreme durability and effectiveness of our insulation cylinders:

As an option, the outside diameter of the ends of the insulation cylinders can be **laminated with graphite foil** to protect them against aggressive media (cleavage products).

CNC machining of the ends of the insulation cylinders results in **extremely tight tolerances** for impermeable and aligned transitions.

Special CFC fabric ensures **high rigidity and optimum surface protection** of both the inside and outside of the insulation cylinder

The joints are bonded for the **impermeable and stable connection** of the individual insulation elements.

The front sides of the insulation cylinder are sealed against **element penetration (metals)**, and this protects the felt insulation against chemical attacks.

Insulation cylinders are heated for **maximum purity and optimum material properties** to more than 2000 °C.

Graphite foils between the layers of felt act as **convection barriers** to reflect the thermal radiation back inside the furnace and so maintain a uniform furnace temperature

Simulation for maximum quality

Graphite Materials continues to work on improving its products. **As part of a scientific research project, we have thus developed a method for evaluating the outgassing behavior of insulation cylinders.**

In addition, Graphite Materials **simulates thermal application cases during manufacture.** This makes insulation cylinders calculable. The results are supplemented by actual energy consumption values from practical experience. This enables the continuous improvement of the materials used and provides the basis for the right insulation cylinders for your operation.

Quick assistance with defects

In the event of an unexpected operational malfunction, Graphite Materials provides quick and straightforward assistance. As we always hold the basic modules for our insulations in stock, we can **produce a replacement for a damaged insulation cylinder within a very short time.** Whether you need a complete cylinder or an individual segment: Graphite Materials delivers every part ready to assemble.

With its many years of experience and understanding of your processes, Graphite Materials is your expert for insulation cylinders. We operate throughout the euro-zone and score points with our expertise and efficient processes.

Advantages of our insulation cylinders for your manufacture:

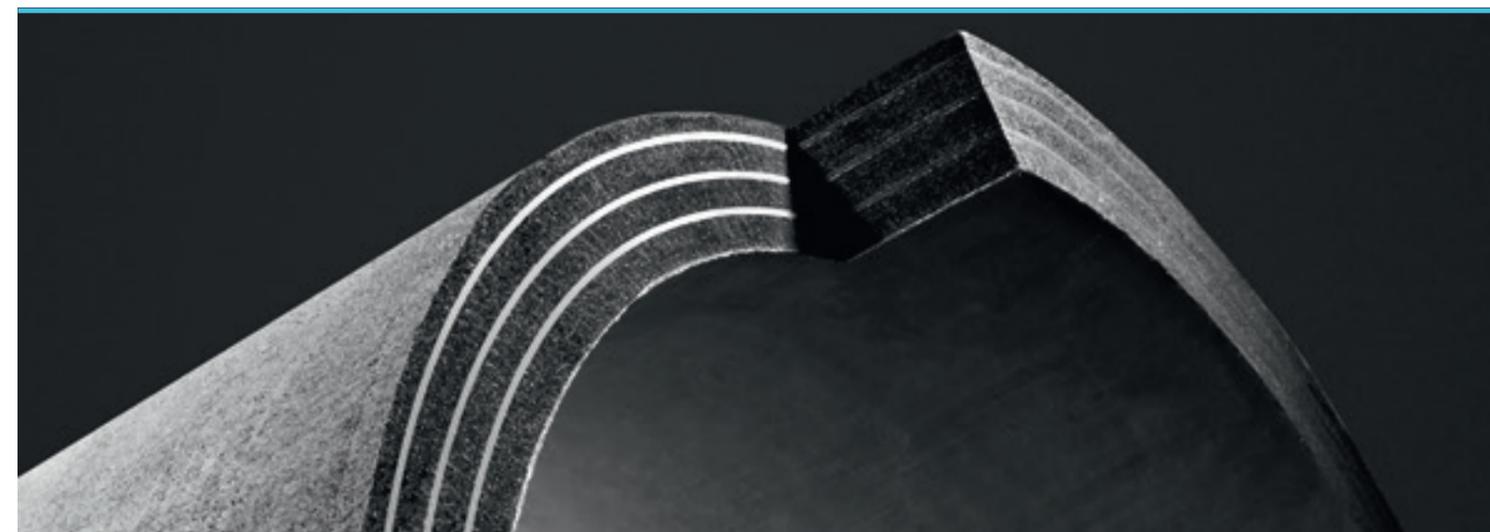
- + Reflective:** Uniform furnace temperature thanks to reflective graphite foils
- + Impermeable:** Extremely tight tolerances for the impermeable and aligned transitions of the ends of the insulation cylinders
- + Rigid:** Extremely rigid insulation thanks to special CFC fabric
- + Protected:** Surfaces and ends of the insulation cylinders have optimum protection
- + Stable:** Bonded joints for impermeable and robust connections between the elements of the insulation cylinders
- + Sealed:** Protection against element penetration and thus break-up due to sealed front sides
- + Pure:** Maximum purity and optimum material properties

Your contact person:



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↓ Cut edge of an insulation cylinder



Furnace components

**Customized.
Tried and tested.
Always available.**
Graphite components
for your furnaces.

You can rely on furnace components from Graphite Materials for your high-temperature applications. We manufacture all components you need for the smooth and effective operation of your heat-treatment furnaces.

Our graphite components are used, for example, in furnaces for the manufacture of permanent magnets, hard metals and silicon ceramics. They withstand temperatures between 900 and 2400 °C. Our premium components are also used in heat-treatment systems, vacuum units, crystal-growing systems and soldering furnaces.

Our recipe for quality?
People, materials, machinery

The performance of your furnaces largely depends on the quality of the materials used in their components. Graphite Materials scores highly here with its experience and specialist knowledge. Our materials engineering department searches extensive databases containing reliable measurement values for the right material. The suitable material is then put through its paces by experienced employees in practical applications. We only use materials that have fully convinced our specialists.

During manufacture, Graphite Materials adapts to your individual requirements. You benefit from our many years of experience and our practical specialist knowledge. These success factors are supplemented by state-of-the-art machinery that is specially adapted for our product portfolio. You receive customized components for high-performance furnaces.

Flexible manufacture and rapid assistance

Graphite Materials manufactures furnace components in single part and series production. We also keep machine capacities in reserve to be able to provide rapid assistance and hold spare parts in stock. In this way, Graphite Materials helps you keep your production up and running.



Current bridges:

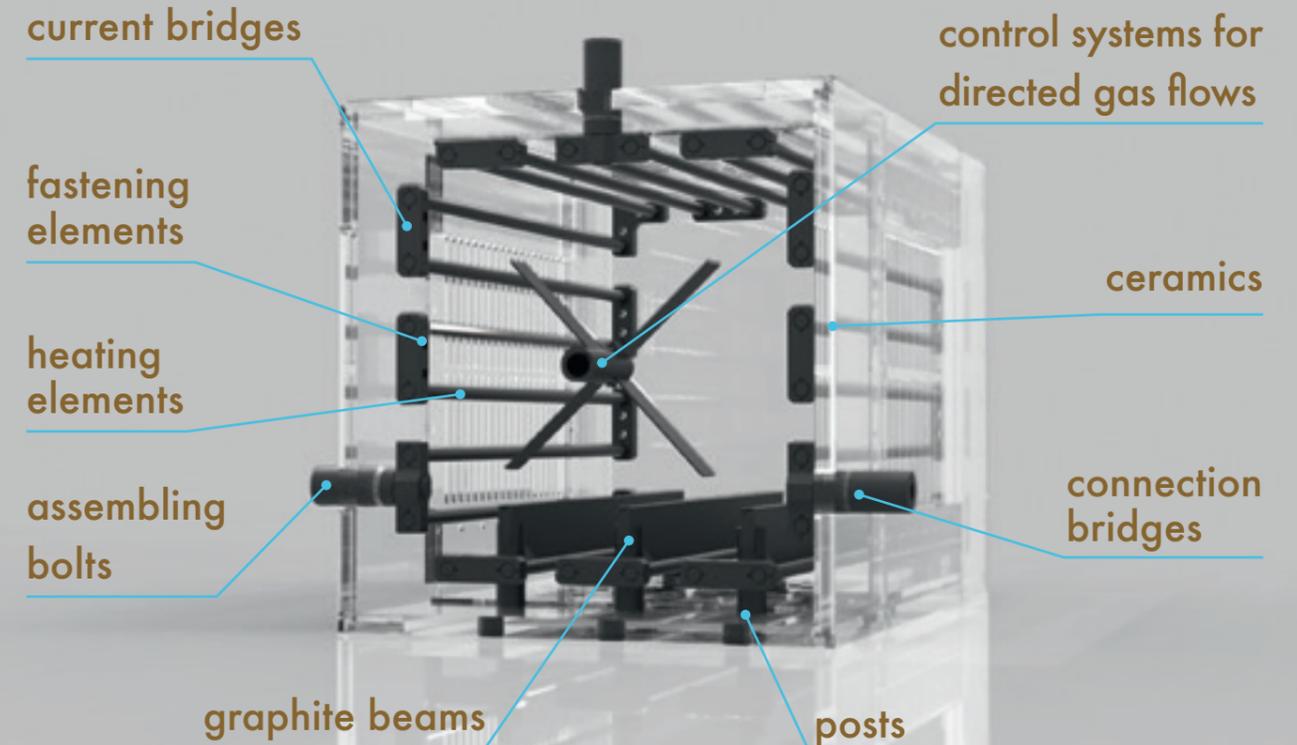
Current bridges position and connect the individual heater elements in the heating chamber and then conduct the current to them.



Assembling bolts:

Assembling bolts are the interface to the external system. They conduct electricity from the transformer to the heating chamber.

Graphite Materials manufactures the following components for your furnaces:



Graphite Materials manufactures furnace components in single part and series production.

Control systems for directed gas flows:

After heat treatment, the microstructures of metallic components are "frozen" by a process of rapid cooling. With gas quenching, flow-optimized control systems, such as CFC diffusers and CFC slotted panels, direct the cooling flow onto the batch. CFC fan wheels also circulate hot gases in the furnace chamber.



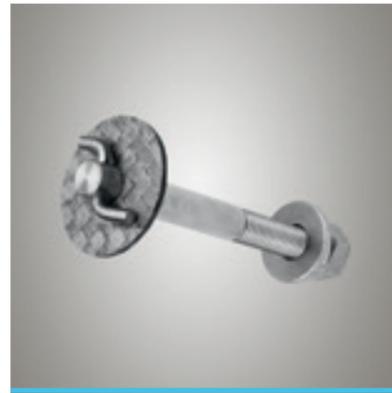
Graphite beams/ posts:

Like a bridge, graphite beams are supported by posts. This enables heating elements to also be installed below the product batch.



Heating elements:

Electricity flows through the heating elements. The resulting resistance causes them to glow and generate heat.



Fastening elements:

Fastening elements include molybdenum bolts to attach current bridges, as well as CFC threaded rods and CFC nuts in all conceivable shapes and sizes. The fastening elements are based on the positive-lock and friction-fit connection technology used in mechanical engineering. These include wedges and bolts, as well as snap couplings and clamp connections.



Susceptors and muffles:

Susceptors and muffles protect the batch against direct thermal radiation from the heating elements. They heat up themselves and emit their heat uniformly to the workpieces (homogeneous temperature distribution).

Advantages of our furnace components for your operation:

- + Fast:** Servicing within eight days, delivery of spare parts generally within 24 hours
- + Established:** High-quality components thanks to years of experience and practical knowledge
- + Measurable:** Database-supported material selection based on extensive measurement values
- + Simulated:** Tested material properties thanks to technical simulation
- + Tried and tested:** Material testing in practical applications by experienced and trained employees
- + Customized:** Individual processing with state-of-the-art machines
- + Flexible:** Manufacture of single parts and series
- + Fast:** Rapid assistance as we hold machine capacities in reserve and have spare parts in stock

Graphite Materials helps you keep your production up and running.



Roller conveyors:

The batch is pushed into the heating chamber on a roller conveyor.



Connection bridges:

Connection bridges are current bridges to which additional assembling bolts can be connected.



Ceramics:

Ceramics insulate current bridges from the steel cage of the furnace.



Furnace trackers:

Dismountable furnace tracker fixtures are essentially special measuring fixtures that determine the temperature distribution in the furnace. They can be used to position the thermal elements in the furnace's hot zone. For sensitive heat-treatment processes, they can be used to determine the precise temperature distribution in the furnace.

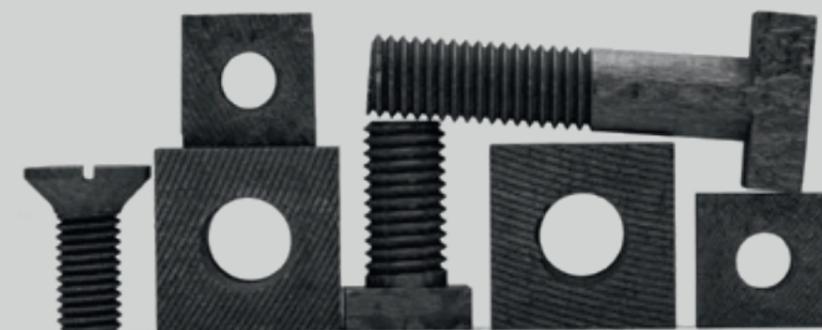
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So much more than the sum of its parts.

You can also visit online at
www.graphite-materials.com





Sustainability is apparent in the materials used, efficient processes and manufactured or traded products. We set high standards and have developed our own environmental management system based on LEAN principles. In September 2017, we were certified in accordance with the requirements of the international standard ISO 14001:2015.

ENVIRONMENTAL PROTECTION MEANS MORE

Save energy,
reduce waste,
preserve reusable materials.

Sustainability is more than just a catchword.



There's no question about it: Like all industrial companies, Graphite Materials consumes resources such as electricity, water and packaging materials. To minimize their use as much as possible, we have implemented a comprehensive environmental management system. In this way, we achieve optimum results – in this case, for the benefit of our environment.

As part of our environmental management system, we continue to document the impact of our actions on the environment and take immediate action when problems occur. Our employees make it a personal concern to use resources consciously and economically, to reduce waste and to preserve reusable materials.

For example, Graphite Materials uses recyclable packaging materials to transport its products. These include corn packing chips, paper buffering material and filling made from recycled card. Polystyrene has been reduced to a minimum. Fragile parts are delivered to you in wooden crates. This not only spares the environment, but it also saves time and nerves when unpacking. It also provides optimum protection for the components transported.

Further measures currently include:

- Light sensors for our lighting system
- Energy-saving, ceiling-mounted radiant heaters as hall heating system
- Use of process heat and thus reduction in consumption of natural gas
- 100 percent use of green energy
- Advising customers on energy-saving measures with vacuum and inert-gas furnaces

Our current environmental policy is available to download in PDF format from www.graphite-materials.com/gm-umwelt-leitlinien.pdf.



Graphite products in a wooden box secured by paper and cardboards →



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Let's keep in touch:

