

# Dispersion

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black. smart. beautiful.





#### Locations and mines

AMG Graphite GK (GK Group) mines natural deposits of graphite in locations in Germany, Sri Lanka, Mozambique and China, refining the raw material to create high-quality special products for customised solutions.



#### Product portfolio

- Natural Powder Graphite
- Natural Flake Graphite
- Natural Amorphous Graphite
- Vein Graphite
- Synthetic Graphite
- Water-based Dispersion
- Oil-based Dispersion
- Powder Premix
- Graphite Paste
- Expandable Graphite
- Expanded Graphite
- Graphene
- Graphite Nanoplatelets (GNPs)

## The GK Group – expertise for over 100 years

Since its inception over a hundred years ago, the GK Group has stood for outstanding raw material expertise, with production facilities on three continents. The company mines and refines natural graphite, processes and modifies synthetic graphite and produces powder, dispersions, pastes, lubricant pre-mixes and expanded graphite.

We guarantee the highest quality levels, based on state of the art processes – from raw materials through to tailor-made solutions developed in close dialogue with our customers. Advanced research ensures that our product portfolio is continuously optimised. The GK Group operates its own mine at its headquarters in Hauzenberg in Lower Bavaria and holds majority interests in graphite mines in Sri Lanka and Mozambique.

The GK Group has been part of AMG Advanced Metallurgical Group N.V. since 2008 and as a global expert in critical commodities, is leading the way when it comes to technologies and high-quality products reducing CO<sub>2</sub> emissions.

The GK Group's global headquarters: GK Germany's operating site (Kropfmühl) in Hauzenberg in Lower Bavaria.





### Mining

We process crude ore to obtain graphite of the highest grade in several steps, thereby developing customer and application-specific products. The major share of the raw materials for the GK Group's graphite products are from its own mining operation. Thanks to secure raw material sources in Asia, Africa and Europe, we can guarantee our customers the highest reliability of supply in connection with consistently high product quality.



### Flotation

In order to enrich graphite as a concentrate, the crude ore is subjected to wet digestion and flotation. In this process, the graphite is separated from its accompanying minerals in order to lift its carbon content to around 96 percent. The flotation process was first used commercially in Kropfmühl at the end of the 19th century – and has been continuously optimised ever since.



### Purification

Further processing steps are required after flotation in order to obtain high-purity grades with a considerably higher graphite content. In the chemical purification process, the carbon content of the graphite is increased, thereby achieving a purity level of more than 99 percent. In thermal purification, purity levels of up to **99.99** percent are even possible.

## Expert in the refinement of graphite

We process crude ore to high-quality graphite and develop products for specific applications and in accordance with our customers' wishes.

The mined ore is first purified in the flotation process. Subsequently, we separate various particle sizes or grind the graphite to different grain sizes – depending on the application and requirements. If higher carbon content is called for, we purify the graphite by way of a chemical or thermal process.

Besides its carbon content, the distribution of the particle sizes reflects the quality of the graphite. We can even produce ultra-fine-grained sizes by means of tailor-made processing steps. The GK Group is constantly honing its refinement of graphite – and in doing so, the Group liaises closely with leading research centres and universities around the world.



### Micronising and sieving

After purification, the raw material is ground to different grain sizes – some of the graphite is even ground to average sizes of less than 2  $\mu\text{m}$ . Different micronising processes affect the morphology of the particles, optimise the particle size of the concentrate and give the graphite the desired form.



### Packaging and logistics

Environmental protection is our paramount objective. That's why we also emphasize sustainability in our packaging. In close consultation with our customers, we find the best solution for transport options that protect the environment. For example, by using silo tankers, we are already saving large amounts of resources, as well as making an important contribution towards protecting our planet Earth.





The new, modern production plant in Kropfmühl offers the best conditions for flexible production and the storage of high-quality dispersions.

## Production from a single source: good for the product and our customers

We select the right grades for our dispersions from our extensive range of graphite with different properties – depending on the purpose for which they are to be used later. By manufacturing at our Kropfmühl facility, we are able to produce the dispersions flexibly and in line with our customers' requirements.



In producing our dispersions, we first prepare powder mixtures: selected graphites are mixed with functional organic and inorganic dispersing additives on a scale measuring tons. This makes our products more homogeneous and easier to reproduce. The powder mixtures are prepared to be sold in Big Bags and paper sacks or for further processing on site.

We continue to process the powder mixtures in various systems, depending on the dispersion medium such as water or oil, by properties such as viscosity or solids content as well as the respective batch size. The differing dispersing systems enable us to offer the entire product range – from a low-viscosity dispersion to a highly viscous paste. In a matter of just a few

days, we are able to provide both very small quantities, packed in containers of five to 50 kilograms and metal drums or IBCs for truck deliveries.

By keeping the entire production chain in house, we stringently monitor every step of the process and respond quickly and flexibly to customer enquiries and orders.

The premix is prepared for dispersing in large steel tanks.



From five kilo sacks up to truckloads: Thanks to our flexibility at the site, we are able to quickly deliver any quantity and any form of packaging.



## Flexible solutions in connection with consistent quality

The GK Group engages intensively with new processing and production techniques as well as analytical methods and is developing special graphite products for novel applications. This positions us firmly as one of the technologically leading manufacturers in this sector.



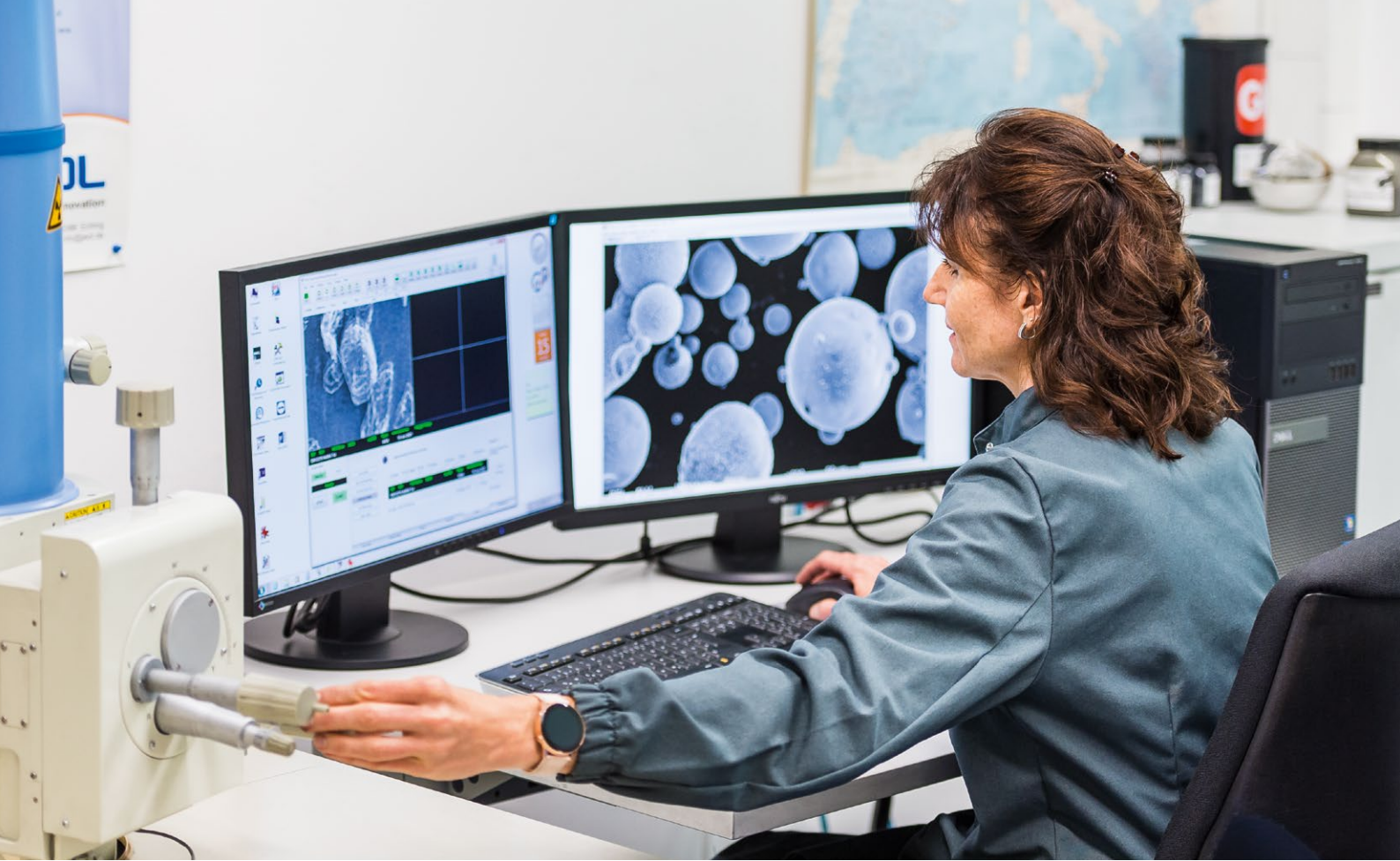
Precision instead of laissez-faire:  
Diligence and prudence are utmost imperatives.



Production is based on machinery, while quality is  
checked manually. With painstaking care.







Our scientists rank among the leading luminaries in their fields – and their excellent research work guarantees the quality of our products.

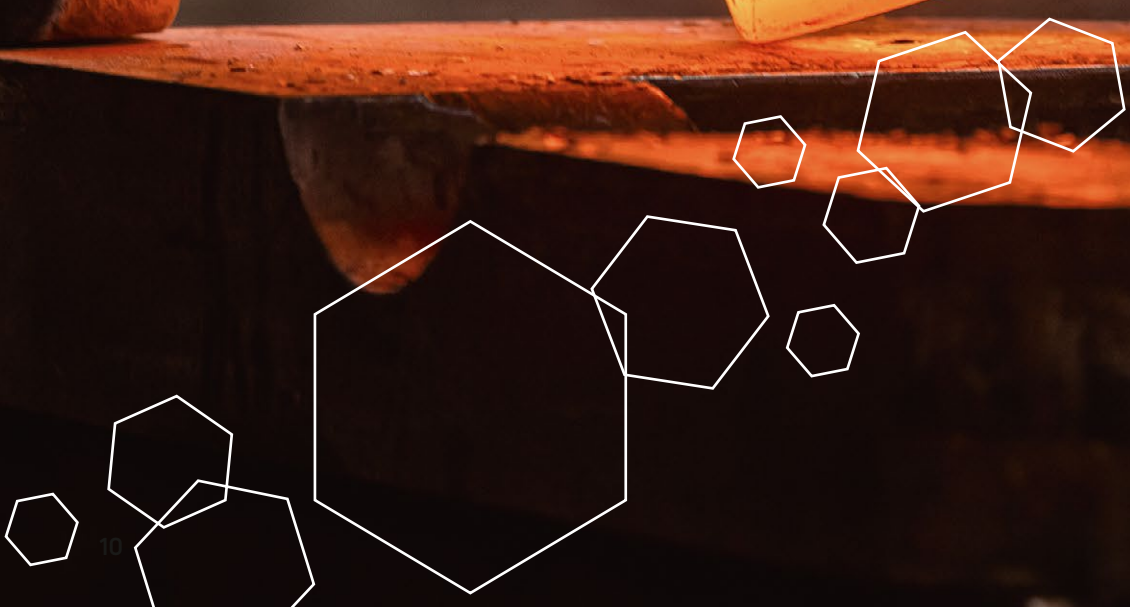
The permanent development and expansion of the product portfolio secures our success. Our intensive working relationship with our customers around the globe is based on partnership and plays an important role in this process. Our researchers and developers prepare customised formulations for integrated solutions and combine the differing application properties with the individual material characteristics of graphite.

By collaborating with leading research institutes and universities on an interdisciplinary basis, our specialists are permanently expanding knowledge in the field of graphite dispersion. Thanks

to different analytical methods and test benches at the Kropfmühl facility such as scanning electron microscopy or X-ray fluorescence spectroscopy, our experts can directly assess products for their suitability for the relevant applications, thereby ensuring their consistently high quality.

APPLICATION AREA

# Forging





# Forming metals and alloys

Since mass production became possible as a consequence of industrialisation, the forging industry has become a cornerstone of the global economy. By supplying components to a wide variety of sectors, our portfolio supports the production of highly diverse forged components.

During forging, the component is usually formed at high temperatures and pressures. For example, when steel is hot formed, the temperature is between 950 and 1,250 °C, but between 750 and 950 °C for warm forging.

## Hot forging

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- Automotive industry
- Agricultural machinery
- Mechanical engineering



Engine and chassis parts are the main components to be hot formed during manufacturing.

## Warm forging

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- Automobile industry
- Energy technology
- Pre-coating of semi-finished goods



The warm forging segment mainly comprises components for drive technology. The graphite pre-coating of semi-finished goods is crucial here.

## Special applications

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- Aerospace
- Medical engineering
- Energy technology



This application area primarily comprises materials such as brass, titanium or aluminium.

# Perfectly lubricated for any application

Thanks to continuous new developments but also the individual adaptation of our products, our customers are guaranteed to receive the optimum lubricant for their process. Whether automatic or manual spraying, immersion or brushing, when it comes to applying the dispersion, our product range is highly flexible.

Our products offer good wetting and optimal drying as a result of which the lubricating, separating and cooling effects remain in balance during hot forming – which in turn has a direct impact on the quality of forged parts and tool life. In addition, our product design enables systems to be easily cleaned. When correctly used, there is no build-up in and around the die.

The spraying agents of the AquaNet, GraphNet and OilNet ranges meet the highest standards and deliver best results in (hot) and warm forging. Our products are also ideal for total loss and circulation lubrication for forging machines, hammer forges and forging presses. They protect from wear and tear, offer good separation and ideal cooling when machining wheel hubs, front truck axles or crankshafts made of (stainless) steel and NF-metals.


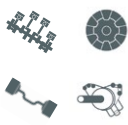





## Your benefits

- Clean handling
- Individual application options
- Process-specific lubrication effect
- Process with high temperature resistance
- High quality of forged components
- Long tool lives



# Forging

Our products are suitable for a wide range of forging applications – and our dispersions can be perfectly attuned to our customers’ requirements on request. Overview:

Product	Characteristics/description	Temperature range	Average particle size	Unit of sale	Application
<b>AquaNet 441</b> 	<ul style="list-style-type: none"> <li>Water-based graphite dispersion</li> <li>Universal lubricants and separating agents</li> <li>For forging large parts with complex contours</li> <li>Highly dilutable, precision forging</li> <li>Solids content: 35 %</li> </ul>	100 – 400 °C	2.5 µm	220 kg drum 1,100 kg IBC	Hot forging
<b>AquaNet 448 HD</b> 	<ul style="list-style-type: none"> <li>Water-based graphite dispersion</li> <li>Universal lubricants and separating agents</li> <li>For forging medium-sized parts with complex contours</li> <li>Highly dilutable</li> <li>Solids content: 28 %</li> </ul>	100 – 400 °C	3.8 µm	220 kg drum 1,100 kg IBC	Hot forging
<b>GraphNet 441/25</b> 	<ul style="list-style-type: none"> <li>Water-based dispersion</li> <li>Universal lubricants and separating agents</li> <li>For forging average-sized parts</li> <li>Solids content: 25 %</li> </ul>	100 – 400 °C	3.3 µm	220 kg drum 1,100 kg IBC	Warm forging
<b>AquaNet 556 W</b> 	<ul style="list-style-type: none"> <li>NPFL dispersion, graphite-free</li> <li>Very high separating effect</li> <li>For forging small/simple parts</li> <li>Active agent: 20 %</li> </ul>	50 – 400 °C	–	220 kg drum 1,100 kg IBC	Special application
<b>AquaNet 441 AL2</b> 	<ul style="list-style-type: none"> <li>Water-based graphite dispersion</li> <li>Universal lubricants and separating agents</li> <li>Special lubricant for aluminium forges</li> <li>For forging medium-sized parts with complex contours</li> <li>Solids content: 25 %</li> </ul>	100 – 400 °C	2.5 µm	220 kg drum 1,100 kg IBC	Special application
<b>AquaNet 457 P/20</b> 	<ul style="list-style-type: none"> <li>Water-based graphite dispersion</li> <li>Piston lubricant for casting</li> <li>For forging delicate parts with complex contours, precision forges</li> <li>Very low build-up tendency</li> <li>Solids content: 20 %</li> </ul>	80 – 400 °C	2.3 µm	220 kg drum 1,100 kg IBC	Special application
<b>OilNet 120</b> 	<ul style="list-style-type: none"> <li>Oil-based graphite suspension</li> <li>Universal lubricants and separating agents</li> <li>Solids content: 20 %</li> </ul>			170 kg drum	<ul style="list-style-type: none"> <li>Metal forming, gravity die casting,</li> <li>Wire drawing</li> <li>Sintering</li> <li>Extrusion</li> </ul>

APPLICATION AREA

# Seamless tubes





# The manufacture of seamless tubes

The production of seamless tubes has been possible for almost 140 years. In 1885, the Mannesmann brothers were issued a patent for their invention – and consequently, a global infrastructure was built for the reliable supply of energy and drinking water.

The advent of seamless tubes enabled systems engineering and mechanical engineering to explore new avenues. Today, this technology is indispensable in the construction sector and automotive industry. Besides rolling processes, the forging processes required for the manufacture of seamless tubes are also subject to permanent improvement with important contributions made by lubricants, separating agents and descaling agents. The GK Group's product portfolio supports a wide range of technologies and production processes revolving around the rolling process.

Seamless tubes are used in various processes, mainly for the extraction of energy raw materials and for the processing and transportation of energy – but also in mechanical engineering, systems engineering and in the automotive industry where seamless tubes are deployed in safety technology. The GK Group offers a broad range of products for the manufacture of seamless tubes.

## Double roll technology

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- Construction industry
- Oilfield equipment
- Mechanical engineering
- Automotive industry



This may also include the push bench process.

## Triple roll technology

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- OCGT tubes
- Oilfield equipment
- Mechanical engineering
- Automotive industry



## Special applications

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- Manufacture of glass cylinders
- Tyre production
- Upsetting
- Tube bending



# Higher quality and greater flexibility in the rolling process

The GK Group is a reliable partner when it comes to the rolling of seamless tubes. We engage with the needs of customers individually and support them with expertise and expedient, sound solutions.

Whether as a powder mixture for dispersion in water or as a finished liquid concentrate, our products are as flexible as we are. Both alternatives can be individually diluted for perfect deployment in the rolling process.

Our products offer outstanding lubrication and separation. They optimise the rolling and forming force, and tolerate fluctuating mandrel temperatures, thereby supporting the stability of the rolling process. By selecting the raw materials used, the heat transfer can be specifically adjusted, thus prolonging the life of mandrel and tools. Our dispersions coat evenly, thereby significantly enhancing the surface quality of the tubes and components rolled.

## Your benefits

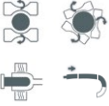
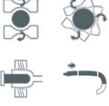
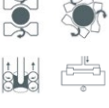
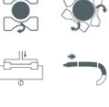
- Long mandrel life
- High mandrel temperature tolerance
- Optimisation of rolling force
- Powder mixture and dispersion concentrate
- Improvement of internal surface quality
- Easy processing





## Special application for seamless tubes

For rolling processes, we offer both powder mixtures and ready dispersed concentrate. A selection:

Product	Characteristics	Forming materials	Tool temperature range (application)	Dispersion medium	Mixing ratio	Application
<b>AquaPowder/ AquaNet 500</b> 	<ul style="list-style-type: none"> <li>• Excellent lubrication properties</li> <li>• Very good separating effect</li> <li>• Easily dispersible</li> <li>• High insulating effect</li> <li>• Environmentally compatible</li> <li>• Very long tool lives</li> <li>• No hard product build-up</li> <li>• No waste water problems</li> </ul>	<ul style="list-style-type: none"> <li>• Steel</li> <li>• Stainless steel</li> <li>• Non-ferrous metals</li> </ul>	80 – 110 °C	Water	20 – 30 %	<ul style="list-style-type: none"> <li>• Tube manufacture</li> <li>• Upsetting</li> <li>• Bending</li> <li>• Anti-sputter</li> <li>• Descaling</li> </ul>
<b>AquaPowder/ AquaNet 905</b> 	<ul style="list-style-type: none"> <li>• Excellent lubrication properties</li> <li>• Very good separating effect</li> <li>• Easily dispersible</li> <li>• High insulating effect</li> <li>• Environmentally compatible</li> <li>• Very long tool lives</li> <li>• No hard product build-up</li> <li>• No waste water problems</li> </ul>	<ul style="list-style-type: none"> <li>• Steel</li> <li>• Stainless steel</li> <li>• Non-ferrous metals</li> </ul>	80 – 125 °C	Water	25 – 35 %	<ul style="list-style-type: none"> <li>• Tube manufacture</li> <li>• Upsetting</li> <li>• Bending</li> <li>• Anti-sputter</li> <li>• Blower lance coating</li> </ul>
<b>AquaPowder/ AquaNet 505 PB</b> 	<ul style="list-style-type: none"> <li>• Excellent lubrication properties</li> <li>• Very good separating effect</li> <li>• High insulating effect</li> <li>• Environmentally compatible</li> <li>• Very long tool lives</li> <li>• No hard product build-up</li> <li>• No waste water problems</li> </ul>	<ul style="list-style-type: none"> <li>• Steel</li> <li>• Stainless steel</li> <li>• Non-ferrous metals</li> </ul>	80 – 450 °C	Water	4 – 35 %	<ul style="list-style-type: none"> <li>• Gas cylinder manufacture</li> <li>• Tyre manufacture</li> <li>• Bending</li> <li>• Tube manufacture</li> </ul>
<b>AquaPowder/ AquaNet 555</b> 	<ul style="list-style-type: none"> <li>• Excellent lubrication properties</li> <li>• Very good separating effect</li> <li>• Easily dispersible</li> <li>• High insulating effect</li> <li>• Environmentally compatible</li> <li>• Very long tool lives</li> <li>• No waste water problems</li> </ul>	<ul style="list-style-type: none"> <li>• Steel</li> <li>• Stainless steel</li> <li>• Non-ferrous metals</li> </ul>	100 – 500 °C	Water	10 – 40 %	<ul style="list-style-type: none"> <li>• Gas cylinder manufacture</li> <li>• Tyre manufacture</li> <li>• Bending</li> <li>• Tube rolling</li> </ul>

AREA OF APPLICATION

# Sintering





# The manufacture of carbides

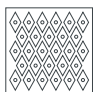
Carbides are used as cutting material for tools – and equally as hard-wearing dies for forming and stamping tools. The different metal powder mixes acquire their special properties during the sintering process.

The material is heated to around 1,500 °C to ensure that the structure solidifies. Depending on the structure and cobalt content, the size of the component shrinks by 20 to 25 percent. In order to prevent the sintered parts from sticking to the plates during the process, graphite separating agents are deployed. They ensure that the green compacts have the best possible gliding characteristics.

## Simple sintered components

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- Defined adhesive and gliding characteristics
- Defined layer thickness of coating
- Dispersion can be sprayed, brushed or immersed



## Complex sintered components

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- Adjustable lubrication and adhesive characteristics
- Defined layer thickness of coating
- Dispersion can be sprayed, brushed or immersed



# Coating of base plates

Working closely with our customers, we develop new, highly purified dispersions for sintering carbides. To ensure that our products, proven over decades, support the production processes of our partners to the best possible extent, we attach great importance to the selection of special graphite grades as well as to their purity and differing types of grinding. This results in dispersions for all user requirements – produced by way of different technologies for setting individual product characteristics and viscosities.

## Your benefits

- Ready-to-use
- Can be evenly sprayed
- Separating effect with defined roughness
- High level of purity
- Characteristics adjustable to customers' needs
- Simple plate cleaning

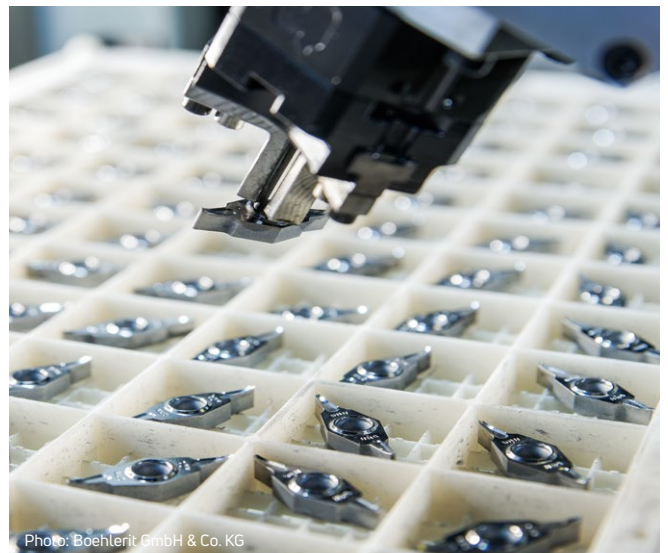
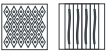
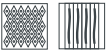




Photo: Boehlerit GmbH & Co. KG

# Sintering

Our GrapAqua product series for application in the sintering process A selection:

Product	Characteristics/description	Average particle size	pH value	Unit of sale	Application
<b>GrapAqua 120</b> 	<ul style="list-style-type: none"> <li>Water-based graphite dispersion</li> <li>Specially treated natural graphite</li> <li>Universal lubricants and separating agents</li> <li>Can be sprayed, brushed or immersed</li> <li>Ecologically and occupationally harmless</li> <li>Solids content: 22.8 %</li> </ul>	9.6 µm	9.8	25 kg hobcock (others on request)	<ul style="list-style-type: none"> <li>Sintering</li> <li>Metal forming</li> <li>Wire drawing</li> <li>Extrusion</li> <li>Gravity die casting</li> <li>Coating gaskets</li> </ul>
<b>GrapAqua 130</b> 	<ul style="list-style-type: none"> <li>Water-based graphite dispersion</li> <li>Specially treated natural graphite</li> <li>Universal lubricants and separating agents</li> <li>Can be sprayed, brushed or immersed</li> <li>Ecologically and occupationally harmless</li> <li>Solids content: 35 %</li> </ul>	6.5 µm	9.0	25 kg hobcock (others on request)	<ul style="list-style-type: none"> <li>Sintering</li> <li>Metal forming</li> <li>Wire drawing</li> <li>Extrusion</li> <li>Gravity die casting</li> <li>Coating gaskets</li> </ul>
<b>GrapAqua 220 H</b> 	<ul style="list-style-type: none"> <li>Water-based graphite dispersion</li> <li>Specially treated natural graphite</li> <li>Universal lubricants and separating agents</li> <li>Can be sprayed, brushed or immersed</li> <li>Ecologically and occupationally harmless</li> <li>Solids content: 24.2 %</li> </ul>	7.6 µm	9.5	25 kg hobcock (others on request)	<ul style="list-style-type: none"> <li>Sintering</li> <li>Metal forming</li> <li>Wire drawing</li> <li>Extrusion</li> <li>Gravity die casting</li> <li>Coating gaskets</li> </ul>
<b>GrapAqua 220/20</b> 	<ul style="list-style-type: none"> <li>Water-based graphite dispersion</li> <li>Highly purified natural graphite, special additives</li> <li>Universal lubricants and separating agents</li> <li>Can be sprayed, brushed or immersed</li> <li>Ecologically and occupationally harmless</li> <li>Solids content: 24.5 %</li> </ul>	25 µm	9.0	30 kg hobcock (others on request)	<ul style="list-style-type: none"> <li>Sintering</li> <li>Metal forming</li> <li>Wire drawing</li> <li>Extrusion</li> <li>Gravity die casting</li> <li>Coating gaskets</li> </ul>

AREA OF APPLICATION

# Special applications



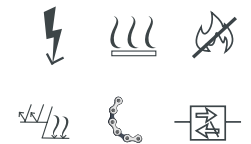
# You trust your application. We trust our solution.

The GK Group refines graphite dispersions for application areas such as metal forming – and develops new mixtures for a wide range of special applications.

The special properties of graphite allow the use of our dispersions in many different technical fields. For example, the thermal and electrical conductivity as well as the high chemical, thermal and mechanical resilience of graphite coatings guarantee optimal functionality in the various applications.

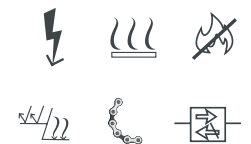
## Functional coatings

- Electrical conductivity
- Thermal conductivity
- Flame protection
- Surface protection (anti-fouling)
- Sliding characteristics
- Insulation, electrical and thermal



## Functional additives

- Electrical conductors
- Thermal conductors
- Flame-retardant
- Emergency running properties
- Insulator, electrical and thermal
- Reflection / absorption



## Special applications

- Coating of ceramic slide plates
- Aluminium roll casting
- Mould coating
- Textile coating
- Roll-Bond



# Individual solutions for every requirement

Thanks to the continuous refinement of our dispersions, our product portfolio provides numerous solutions for a wide range of special applications. Most special products are developed by our experts together with the users – customised and adapted to fit the particular requirements.

Access to different graphite grades, a wide range of additives and the varied dispersing and mixing systems in our production facility position the GK Group as a strong and preferential partner for you in the development of special products. Hand-in-hand with our customers, we select the right graphites from around 60 different basic grades available, including H1-certified graphites. Besides traditional oil, solvent and water-based dispersions, we also offer mixtures which are specially adapted to the wishes and requirements of our customers.

Diverse products enable diverse applications, e.g. in the automotive industry, textiles or the construction sector. On request, we can also supply our products individually labelled and specially packaged.

Customer-oriented and solution-driven: our team of experts

## Your benefits

- Support in application engineering
- Selection of different graphite grades
- H1-certified graphite
- Oil, solvent and water-based products
- Customised development projects
- Individual special packaging





## Special applications

The following table gives an overview of our product portfolio in the area of special applications. Together with our customers, we also develop individual products – based on the particular requirements and wishes.

Product	characteristics	Application
<b>AquaCoate 100</b>	<ul style="list-style-type: none"> <li>• Water-based graphite dispersion</li> <li>• Natural graphite</li> <li>• Outstanding separating effect</li> <li>• Thermally and electrically conducting</li> <li>• Suitable for the production of light metals</li> </ul>	Functional coating
<b>AquaCoate 400</b>	<ul style="list-style-type: none"> <li>• Water-based graphite dispersion</li> <li>• Synthetic graphite</li> <li>• Thermally and electrically conducting</li> <li>• Outstanding separating effect</li> <li>• Suitable for textile coating</li> </ul>	Functional coating
<b>V-GK C 28 L mod</b>	<ul style="list-style-type: none"> <li>• Water-based graphite dispersion</li> <li>• Natural graphite</li> <li>• High electrical conductivity</li> <li>• Can be mixed with V-GK R 28 L in any ratio</li> <li>• Electrical resistance adjustable</li> </ul>	Conductivity applications
<b>V-GK R 28 L mod</b>	<ul style="list-style-type: none"> <li>• Water-based carbon black dispersion</li> <li>• Conducting carbon black</li> <li>• High electrical conductivity</li> <li>• Can be mixed with V-Gk C 28 L in any ratio</li> <li>• Electrical resistance adjustable</li> </ul>	Conductivity applications
<b>Grap Dispersion 602</b>	<ul style="list-style-type: none"> <li>• Solvent-based graphite suspension</li> <li>• Natural graphite</li> <li>• Fast drying</li> <li>• High temperature resistance of coating</li> </ul>	Functional coating
<b>GraphPaste 400</b>	<ul style="list-style-type: none"> <li>• Polymer-based graphite dispersion</li> <li>• Packed with natural graphite</li> <li>• Water-soluble</li> <li>• High temperature resistance of coating</li> </ul>	Lubricants and separating agents / Functional coating

# The parent company

As a global specialist in critical raw materials, AMG Advanced Metallurgical Group N.V. is championing technologies and high-quality products geared to reducing carbon dioxide emissions.

The AMG Group produces advanced special metals and mineral products and offers vacuum furnace systems and services. With around 3,000 employees around the world, the company services international customers in the sectors of transport, infrastructure, energy as well as special metals and chemicals. By means of metallurgically based solutions for industry, the AMG Group is meeting the growing demand for saving energy and protecting resources, and developing advanced products and technologies for a wide range of applications.

## Target markets for the AMG Group



### Transport

AMG is responding to technical innovations which boost the demand for critical materials in the transport sector and providing advanced metallurgical solutions. They make operations more efficient, lower the weight of aircraft and improve cost-effectiveness. The light alloy, titanium aluminiumide, for example, reduces the weight of engines, optimises fuel consumption and lowers carbon emissions in the aerospace industry.



### Infrastructure

Improvements in infrastructure are required to increase global GDP and at the same time to reduce CO<sub>2</sub> emissions. Critical materials such as ferrovanadium for high-strength steels and graphite improve the insulation performance of buildings – with the result that here, too, AMG is helping to meet the demands of the global trend towards urbanisation.



### Energy

The global demand for energy continues to grow. AMG commands metallurgical technologies which contribute towards improving energy efficiency while at the same time increasing the supply of energy. One example is silicon metal which the solar sector uses to produce polysilicon.

Silicon  
Tantalum  
Chromium  
Nickel  
Titanium  
Graphite  
Lithium  
Aluminium  
Molybdenum  
Niobium  
Antimony  
Ferrovanadium



8

Mines



3000

Employees



32

Locations



#### Special metals and chemicals

Special metals and chemicals are used to manufacture products which improve global living standards. The AMG Group is meeting the high market demands with customised, metallurgical solutions. These include tantalum that is used as a capacitor in electronics, as well as vanadium-based chemicals which improve the insulating and infrared-absorbent properties of structured glass and chemical compounds.



1 bn

dollars of sales in 2021



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