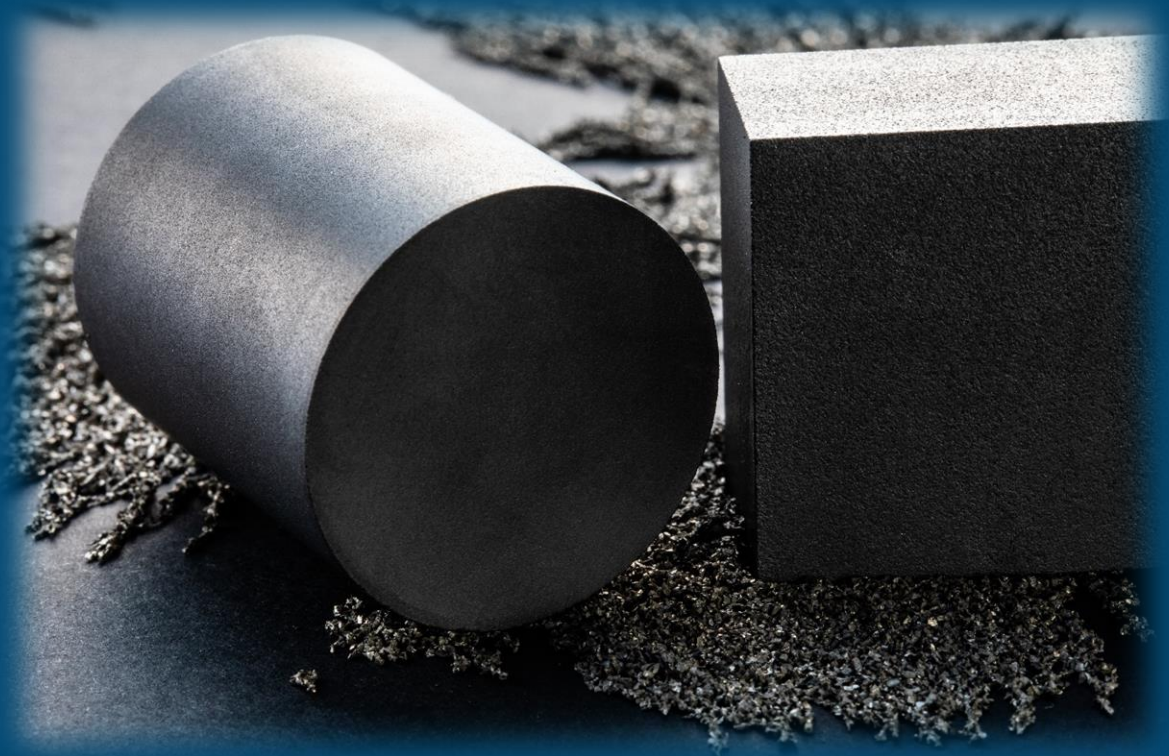


Specialties Datasheets

From the Specialists of Secure Graphite Supply



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GES

GLOBAL GRAPHITE

“The Safe Haven of Graphite” – Since 1968

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Executive Summary

On the following pages you are going to learn the most important graphite specialty grades we offer. Pages 3 & 4 introduce you to our range of [fine grain products](#) in blocks and rods. On page 5 you are introduced to our [iso-cold molded specialties](#) that may be a price-effective alternative for projects you must win.

You may save even more costs by outsourcing some of your most labor-intense machining steps to our specialized machine shop in China. This [machining service](#) is detailed on page 6.

Finally, on pages 7 to 9, we explain to how you are going to [receive a consistent graphite quality from delivery to delivery](#) – or your money back.

Fine Grain Graphite

Block Formats

Our fine grain graphite product has perfect homogenous structure that makes it easy to machine for you. GES Europe offers its specialty graphite Blocks in 3 grades to perfectly match your requirements.

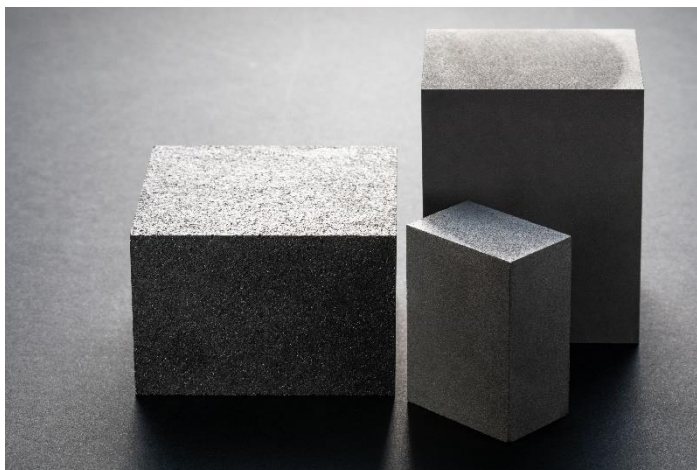


Figure 1: Our fine grain graphite blocks are easy to machine and comes in 3 grades.

Grade Name	PF	PFR	PFR-N
Bulk Density	1.65	1.72	1.74
Ash Content	< 0.3 %	< 0.2 %	< 0.1 %
Particle Size	2.0	0.8	0.8
Resistivity	10.0	8.0	8.5
Bending Strength	13.0	16.0	19.0
Compressive Strength	27.0	35.0	39.0
Standard Sizes	Upon request	850/650x400x1830mm, 650x500x1830mm	650x500x1830/2200mm, 650x650x1830mm

(* Unit: Bulk density= g/cm³, Particle size=mm, Resistivity=μΩm, Bending strength/ Compressive strength=MPa)
(* The above data should be regarded as general information, not guaranteed specification limits.)

PF Grade is an ideal economic material for simple applications.

PFR Grade is the most popular multi-purpose material with higher density, higher mechanical strength, and less porosity.

PFR-N Grade is suitable for applications which have strict requirements on the material with a very homogeneous grain structure.

Rod Formats



Figure 2: Our Extruded graphite rods are easy to machine and comes in 2 grades.

Our extruded graphite product has perfect homogenous structure that makes it easy to machine for you.

GES Europe offers its Rods in 2 grades to perfectly match your requirements.

Grade Name	PRD	PRD-N
Bulk Density	1.65	1.72
Ash Content	< 0.2 %	< 0.1 %
Particle Size	0.8	0.8
Resistivity	8.0	7.5
Bending Strength	16.0	20.0
Compressive Strength	35.0	40.0
Standard Sizes	45x1250mm, 50x1250m [100...500] x 1800mm	

(* Unit: Bulk density= g/cm³, Particle size=mm, Resistivity=μΩm, Bending strength/ Compressive strength=MPa)
(* The above data should be regarded as general information, not guaranteed specification limits.)

Iso-Cold Molded Graphite

GES Europe offers a set of 5 isostatically cold-molded **PCC-15 and -35** Grades with very fine grain sizes, increasing strength and density. **PCC** materials are alternatives for many Isostatically pressed grades used in continuous casting dies, crucibles and heating elements. **PCE-15 and PCE-25** are used for EDM roughing and finishing work. **PCS-35** is a superior grade for many sintering applications.



Figure 3: We offer 5 cost-effective alternatives to isostatic graphite

Grade Name	PCC-15	PCC-35	PCE-15	PCE-35	PCS-35
Bulk Density	1.75	1.85	1.82	1.90	1.90
Ash Content	50	50	50	50	50
Particle Size	15	15	10	10	8
Resistivity	9.0	10.0	12.0	13.0	8.5
Bending Strength	38.0	46.0	48.0	60.0	55.0
Compressive Strength	65.0	85.0	115.0	135.0	95.0
Thermal Conductivity	110-120	130-140	85-110	85-110	149
Shore Hardness	42	48	65	70	53
C.T.E	5.46	4.75	5.8	5.8	5.1
Standard Sizes	510x310x210/250 mm 610x510x250 mm		Upon request	Upon request	Upon request

(* Unit: Bulk density= g/cm³, Ash Content = ppm Particle size=μm, Resistivity=μΩm, Bending strength/ Compressive strength=MPa, Thermal Conductivity= W/mK, Shore Hardness=HSD, C.T.E= 10⁻⁶/K)

Graphite Machining - Outsource time consuming jobs & free up capacities

Are you searching for a cost-effective solution for time-intensive work such as cutting blocks into plates?

Or maybe you currently don't have the machining capacity to do this by yourself? In any case, we provide you with semi-machining and refining services such as surface peeling and customized size cutting for specialty graphite products and electrodes. Popular semi-finished products include:

- Customized graphite rods,
- Customized graphite rounds,
- Customized graphite blocks
- Customized graphite plates
- Electrodes starting bars.
- Tubes



Figure 4: GES Asia Pacific testing & machining centers, member of the GES family—outsource your time-consuming work and save you costs.

To meet customer requirements, we process graphite products in well-equipped graphite workshops all over the world. Thanks to these facilities, we can offer dimensioning to suit your specific requirements.

With our advantages on raw material purchasing volumes and a full set of efficient graphite machining equipment and CNC machines, we serve our customers with tailor-made graphite products to cut your costs and free up machining capacity.

GES Graphite in Consistent Quality & Performance

GES Graphite fine grain & iso-cold molded specialties are manufactured using high performance petroleum- and needle coke from internationally recognized refineries in South Korea, Japan and China. For a low electric resistivity and a therefore prolonged smelt in your furnace.

Each product is impregnated with a special mixture of coal tar pitch and in state-of-the-art extruders and tunnel kiln chambers. For you as a user, this results in a slow oxidization rate and higher mechanical strength.

All physical properties confirm with international NEMA standards. The test standards are documented according to both DIN/ISO & ASTM.



Figure 5: GES Graphite products are made from petroleum- and needle coke from internationally recognized sources in South Korea, Japan & China for a longer smelt in the furnace.



Figure 6: The test standards are documented according to both DIN/ISO & ASTM for better comparison.

To ensure a stable and reliable quality, Graphite Manufacturers are audited every year using a sophisticated 34 item scale.

It includes criteria such as political and environmental impact, production facilities and modern equipment as well as management team and leadership succession plan.

On the next page, you are going to learn about our own **in-house quality check to ensure a stable graphite & consistent quality.**

GESApproval Quality Check for Stable Graphite Quality

The GES Quality check is an in-house quality check performed by GES Asia Pacific, Ltd. whose premises are located within only 15 km of 3 of the biggest graphite producers.

The GES QA process consists of 4 parts: the macro check that takes about 3 hours, the micro check, good's approval and packing/stocking.

For you this means that **you will receive a stable and consistent quality of graphite products**. The blocks, rods and electrodes in your warehouse have all the same density – the most important property of graphite products. Next time you walk to your production facility to meet your chief technician, you will see a bright smile in his face while he describes how he was able to stabilize his production output. Because he knows that it was due to your effort to try the GESApproval system.

What you'll get

The inspection results are thoroughly documented on 2-4 pages full DINA4 documents. For **each single graphite electrode or fine grain graphite item**, the data is presented on a comprehensive list of 5 crucial technical parameters such as bulk density, weight and electrical resistivity. Clearly laid out in table format. You hold our certificates in your hands within 2 weeks after you have placed your order.

Tests are done by our assiduous 28-headed quality-assurance team led by 2 experienced mechanical engineers on a 4970 m² property.

GES Asia Pacific has been focusing on Graphite testing for 6 years and – in case they find a defect – are also able to cut, drill and clean. Half of our staff has been working in the graphite industry for a minimum of 5 years

GES/CHINA/CO., LIMITED

Inspection Report

Graphite electrodes VSP grade Size 224 ~ 226mm dia x 1350 ~ 150mm with 130 724 single supplied quantity

Order No.	GE No.	Dia mm	Length mm	GE			Order No.	GE No.	Dia mm	Length mm	GE		
				Weight kg	Density g/cm ³	RES μΩm					Weight kg	Density g/cm ³	RES μΩm
1-22	1	224	1350	101	1.45	5.7	1-22	1	224	1350	101	1.45	5.7
	2	224	1350	101	1.45	5.6		2	224	1350	101	1.45	5.6
	3	224	1350	101	1.45	5.6		3	224	1350	101	1.45	5.6
	4	224	1350	101	1.45	5.6		4	224	1350	101	1.45	5.6
	5	224	1350	101	1.45	5.6		5	224	1350	101	1.45	5.6
	6	224	1350	101	1.45	5.6		6	224	1350	101	1.45	5.6
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	8	224	1350	101	1.45	5.6		8	224	1350	101	1.45	5.6
	9	224	1350	101	1.45	5.6		9	224	1350	101	1.45	5.6
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3-22	11	224	1350	101	1.45	5.6	3-22	11	224	1350	101	1.45	5.6
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5-22	31	224	1350	101	1.45	5.6	5-22	31	224	1350	101	1.45	5.6
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	38	224	1350	101	1.45	5.6		38	224	1350	101	1.45	5.6
	39	224	1350	101	1.45	5.6		39	224	1350	101	1.45	5.6
	40	224	1350	101	1.45	5.6		40	224	1350	101	1.45	5.6

Figure 7: detailed Inspection Report by GES



Figure 8: GES Asia Pacific testing centers, member of the GES family – to ensure a stable quality.

GES Quality Guarantee

Have you ever received a Performance or Quality Guarantee? This is a rare bird those days because manufacturers and traders often outsource important steps in the graphite making.

They can't control the behavior of their outsourcing partner and thus don't want to make any quality promises. GES is different! **If you want to learn how GES guarantees its quality standards - Read on.**

GES Quality Approval Stamp

After all tests have been concluded, each Euro-Palette receives a 14cmx8cm sticker that shows the blue GES® Europe quality stamp – called GESApproval™. Each palette you receive from us absolutely must bear our quality approval sticker.



Figure 9: Each Euro-Palette bears the GES quality stamp to guarantee GES quality standards.

GES Money Back - Guarantee

As a GES Customer you will get back 100 % of your money if GES fails to deliver the material with the Minimum Density tested in the GES quality check.

That means for you that if you detect a minimum density of less than that stated in the analysis certificate, you are entitled to 100 % reimbursement of your money.

Please contact our quality assurance staff to get your quality guarantee certificate under qa@geseurope.eu.

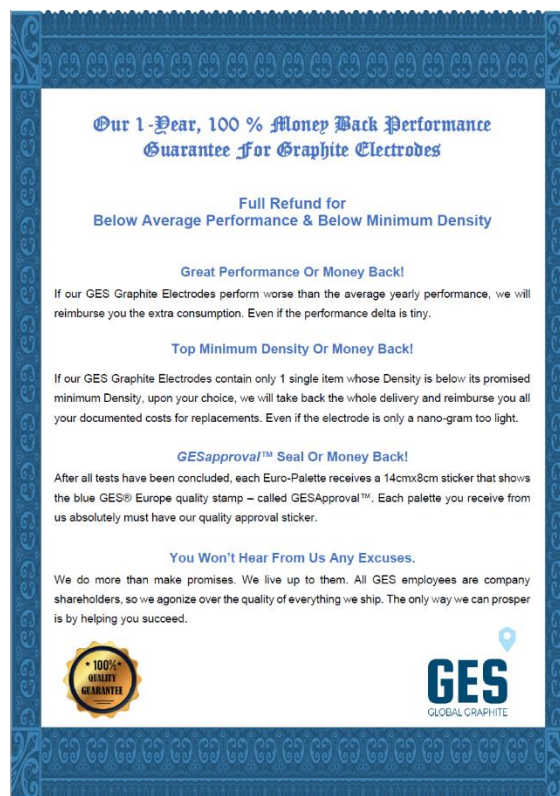


Figure 10: GES 100 % Money-back guarantee for Minimum Density & Performance

Handling Logistics Suddenly Becomes So Comfortable

After your order, your products arrive at your place within maximum 8 weeks (or after 2 weeks in case of a GES warehouse order).

During the time of transportation and transit, GES takes care of all logistical matters including

- ✓ customs handling
- ✓ High standard international trade packaging ready for sea-transport, customize option also available
- ✓ Full range of shipment options (FOB, CIF, DDU, DDP)

Optionally you may choose to store your goods in our 3570 square meter Hamburg warehouse.

You will hear back from us at least 2 times during the process of delivery.



Figure 7: Container for Sea-Transport for a safe transport.

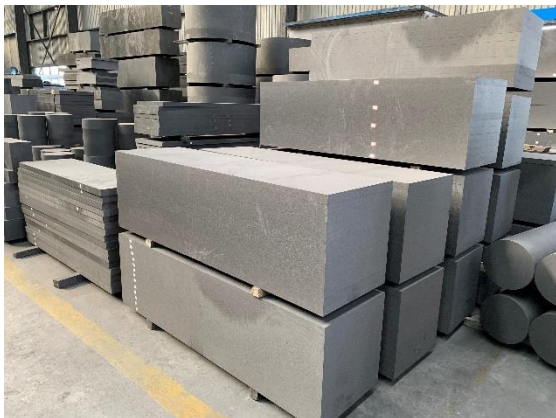


Figure 8: Your graphite products are wrapped into reusable wooden boxes or extra strong paper cardboard for a minimum garbage disposal.

When you receive your analysis certificate with the most important properties tested by the GES in-house quality check and when we inform you that the goods have left the warehouse.

The graphite blocks and rounds are wrapped into reusable wooden boxes or extra strong paper cardboard for a minimum garbage disposal. The graphite products rest solidly on wooden Euro-Pallets.

In addition to the standard shipping marks each item is identified on the body with the *GES Graphite* name, serial number and net weight.



Get Your Free Sample & Test Our Fine Grain Graphite

From now on we have our 3 most popular graphite grades in our Hamburg warehouse for free sampling for you. These are the proven qualities: PFR, PFR-N and PCC-35.

The material parameters are

- PFR grade: min 1.72 density
- PFR-N grade: min 1.74 density
- PCC-35 with 1.85 density.

Please Note: You'll receive only AUTHENTIC samples that would not necessarily win a beauty contest!

Our own samples come from random blocks in our own GES machine shop in China. This means that the **sample blocks' surface look "real" as would be Your 1st delivery, the 2nd delivery ... delivery 1001.** With our samples we want to give you a genuine taste of our graphite. There's nothing beautified - nothing polished.

The samples you'll receive

For your tests you will receive PFR, PFR-N as already cut blocks in the dimensions 300x300x100mm and PCC-35 in 200x200x75mm. The deal: We take over the material costs; You take over the collection costs from our Hamburg warehouse to your machine shop.

Next 3 Steps to Your Free Sample Blocks

1. **Send an email to > sales@geseurope.eu < with the text "Specialty samples"**
2. Write which material you would like to test:
PFR, PFR-N, PCC-35 or all 3 types of material.
3. We prepare your samples and give you the pick-up address.

Limited Quantity Available Only!

Disclaimer

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