Carbon coating

Practice tips

HP-Textiles

About us

Since the company was founded in 2004, HP-Textiles GmbH has stood for the development and distribution of fibre-reinforced materials. In addition to a wide range of fibre reinforcement materials and specially formulated epoxy resins, further strategic business areas have been created with DeinTeich.de and bredderpox®. As a result, our satisfied customers include not only the composites industry but also users from the pool construction and surface protection systems sectors.

Our business areas:

Composite Materials	GRP Coatings	Building Chemistry
www.hp-textiles.com/shop	www.deinteich.de	breddermann-kunstharze.de

In order to guarantee our business partners a continuously high quality of our services as well as optimal process reliability, the quality management of HP-Textiles was certified according to DIN EN ISO 9001 in 2011. Through enthusiasm and passion for scientific research, coupled with an understanding of our customers‘ wishes, we guarantee optimal product properties in the future as well.
Together with strong partners from science and industry, we also offer custom synthesis and manufacturing of a wide variety of products. The establishment of a networked, cross-company development allows us to respond to customer wishes even at short notice. Variable batch sizes enable us to supply large industrial customers as well as small quantities for project developments.

Our young, qualified team, a large warehouse and reliable logistics partners guarantee fast processing of your order.

The constant further development of our product range should also be a basic requirement in the future in order to guarantee optimum component properties at economical prices!

Your team of
HP-Textiles GmbH

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Carbon

Carbon fiber components

Carbon fabrics have become indispensable in many high-performance applications.
Without this material, many borderline areas in aviation and aerospace, sports equipment construction, wind power and and motor sports could not be achieved without this material.

The tensile strength of carbon fiber reinforced plastics (CFRP) is many times higher than that of conventional aluminum or steel materials, conventional aluminum or steel materia.
At the same time, components made of CFRP are significantly lighter than metallic materials.
The typical carbon look thus stands for a new material with high-end properties.

Sports seat shell for Ferrari 360/430,
Made in IMC/MTI process (full CFRP)

►Further details on the production of CFRP components using the IMC/MTI process can be found in our online store in the „Downloads“ section or under „Videos“.

Carbon coating

In addition to the manufacture of complex GRP components, existing parts can also be coated with carbon.

On the following pages we have compiled the procedure for carbon coating, including various tips and tricks.

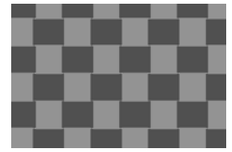
A steering wheel coated with carbon fabric.

Tuning for the next generation.
A CRFP coated children‘s slide car.

Material selection

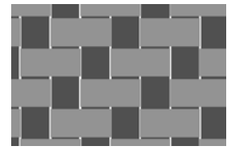
Optimal carbon fabric

Plain :
This weave is the simplest type of weave. It originated from weaving, where the weft and warp alternate evenly. Since the fabric looks the same from both sides, it is suitable for flat and simple components.



Plain weave

Twill:
With twill weave, the weft and warp do not alternate evenly.
Both sides look different. The side of the fabric with more warp threads is called warp twill and the other side is called weft twill.
This fabric is easier to lay around curves.



Twill weave (2/2)

	Plain	Twill
Drapeability	+	++
Sliding strength	+++	++
Strength in laminate	+	++
Surface smoothness	++	++

+++ very well suited **++ well suited** **+ suited**

►A detailed selection guide to the carbon fabrics can be found on page 18.

Ideal for beginner

The complete set for carbon coating HP-KS-CB

In order to gain initial experience with the products, we offer our complete set for carbon coating.

In addition to the epoxy topcoat system, this set also includes the carbon fabric as well as many tools and aids.

The comprehensive complete set for carbon coating

Overview carbon fabric

Item number	Description Fields of application and remarks
HP-P80C (80g/m², Plain) HP-P96C (93g/m², Plain)	**very light and fine carbon fabric** Use in fine model making, coating of switches or other very complicated components, jewelry, watches, ...
HP-T240C (245g/m², Twill)	**Design carbon fabric** Coating of automotive parts, motorcycle / scooter fairings, furniture, ... **THE TOP SELLER** - very often used for carbon visible parts ! ► available in widths of 1m, 1,25m and 1,50m (engine hoods, roof parts, ...)
HP-T240CE (245g/m² „slippage-resistant“ Twill)	Not so susceptible to displacement! Primarily for sheet goods.
HP-T240/125CE (245g/m², Twill, + thermoplastic fixation)	Not so susceptible to displacement! Also for complicated geometries.
HP-T160C (160g/m², Twill) HP-P160C (160g/m², Plain) HP-T200C (200g/m², Twill) HP-P200C (200g/m², Plain)	**medium weight carbon fabric** Coating of automotive parts, motorcycle / scooter fairings,...
HP-T286C (285g/m², Twill)	special weave (twill 4/4) - therefore very well drapable due to the open weave setting light backg- rounds shine through
HP-T193C (193g/m², Twill) HP-P193C (193g/m², Plain)	**Spread Tow** Fabric with very wide optics
HP-T405CER (205g/m², Twill) HP-T405CEB (205g/m², Twill)	**Carbon design fabric colored** Use in orthopedics, furniture construction, coating of automotive components
HP-T285C (285g/m², Twill)	**Carbon design fabric colored „glitter carbon** Used in furniture and sports equipment -Slide resistant with dense weave -available in different colors

Material selection

Optimal epoxy resins

Why epoxy resin?

Epoxy resins exhibit particularly high adhesion to many substrates. They are the preferred resin matrix when processing carbon fabrics. Where for example polyester resins often reach their performance limits, epoxy resins are often the more effective solution.

Advantages of epoxy resin

✓ Very low material shrinkage (material shrinkage)
The individual components of the epoxy resins react via a so-called addition reaction, whereby no reaction products are released. Therefore there is loss of volume is much lower than in the case of vinyl ester or polyester resins.

✓ Free from solvents
Thus no odor nuisance due to solvents!
In addition, e.g. sandwich foams are not attacked.

✓ Very good adhesion properties
Due to its high adhesive strength, it can also be used on existing substrates (polyester-laminate, wood or many metals).

✓ Suitable for processing high performance fibers (aramid, carbon,...)
Process high quality fibers with high quality resins!

✓ Permanently high mechanical strength (low fatigue behavior)
Compared to conventional polyester laminates, composites with epoxy resins have significantly higher resistances.

✓ Very low water absorption / pronounced osmosis protection
Epoxy resins are characterized by a very high water vapor density!
In addition, relatively high film thicknesses can be achieved with only a few coats.

Tempering information

Epoxy resins should always be subjected to post-curing. This significantly improves the mechanical values and also the heat resistance.

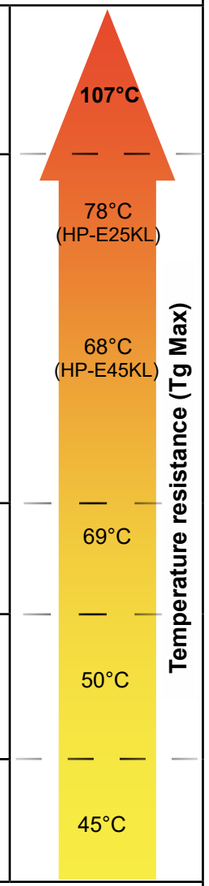
Background: A higher degree of crosslinking and thus also better strength and resistance is achieved by subsequent heat addition.

Details can also be found in our instructions for annealing as well as in the data sheets of the respective systems and further instructions.

Carbon coating on an exterior mirror

Selection guide for epoxy resins

Application area	Product	Information
Priming smooth, non-absorbent substrates	**HP-UC-9004**	**Primer and adhesion promoter** Processing on: Glass, metals, tiles, many plastics,... **Coloured black, so the substrate does not shine through!** Pot life approx. 20-30 min.[1]
Priming slightly poroua to highly absorbet substrates	**HP-E80FS**	**Primer and adhesion promoter** Processing on: Metals, GRP, wood,... Pot life approx. 35 Min.[1]
Infusion	**HP-E200GL**	**Infusion resin,** **increased temperature resistance,** - very low viscosity - Pot life approx. 200 Min.[1]
Laminating (fiber impregnation, also serveral layers of fibers possible) **+** **Epoxy top coat** (Suface spedialists with improved UV resistance. Also as laminating resins applicable Impregnation of up to 2 layers of fabric)	**HP-E25KL** **or** **HP-E45KL**	**Multipurpose systems,** **Adhesive and laminating resins** Improved adhesion to „difficult“ substrates, chemical resistant Pot life approx. 25, bzw. 45 Min.[1] **Our recommendation for beginners !**
	HP-E25DM	Topcoat resin, colorless, medium viscosity Pot life approx. 25 Min.[1]
	HP-E40D	Topcoat resin,, colorless, low viscosity (thin) Pot life approx. 40 Min.[1] sprayable with thinner XB
	HP-E25D	Topcoat resin, colorless, low viscosity (thin) Pot life approx. 25 Min.[1]
Clear lacquer high quality surfaces, good weather and UV protection	**HP-PUR**	2-component PUR paint for high-quality surface coatings Pot life approx. 3 h[1]
	HP-KL400 (1K-Lack)	1K paint for almost all solid surfaces Pot life approx.30 min.[1]



Footnotes:
[1]All data at 20°C and approx. 60% room humidity.

The processing

Pretreatment of the surface

To ensure that the coating adheres for a long time, the substrate must first be sanded and cleaned.
Here is an overview of the pretreatment steps:

1	The substrate must be dry and free of silicone or grease. First, the surface must be degreased with a suitable solvent (e.g. acetone). The entire surface must then be sufficiently deaerated!	
2	**Wood**	Types of wood with a high resin / oil content (e.g. teak) are difficult to bond. Here, the surface must be degreased particularly intensively and roughly sanded against the grain! Sandpaper with grit 60-180
	GRP	Sandpaper with grit 60-120
	Metal	Blast or roughly grind with angle grinder. Any oxide layer must always be completely removed and the epoxy resin then applied within 2-3 hours.
	Alu	Degrease and carefully grind. Anodized aluminum / aluminum alloys should be additionally etched if necessary!
	Plastics	Special rules apply here! We recommend the use of our adhesion promoter. The surface should be carefully cleaned and degreased! The residues from the release agent must be completely removed. The surface must then be prepared several times with suitable solvents and abrasive pads. Before coating, wait until all components of the solvent have evaporated. *Note: Industrially, injection molded parts are often produced using internal release agents. To remove residual release agents, these plastic parts must be subjected to annealing (heat treatment).* *Depending on the type of plastic, approx. 0.5-2h at 50-60°C are necessary.*
3	The grinding dust should be removed with compressed air or a vacuum cleaner!	
4	Clean the surface again with a solvent and let everything flash off for a sufficiently long time!	

Tips:
1. the surface must dry long enough (flash off).
In addition, the coating surface should be brought to „operating temperature“.
(Background: Surfaces that are too cold massively slow down the curing speed!
There is also a risk of condensation).
2 To protect yourself from the grinding dust, we recommend wearing suitable protective clothing!
Professional grinders with connected extraction are ideal.

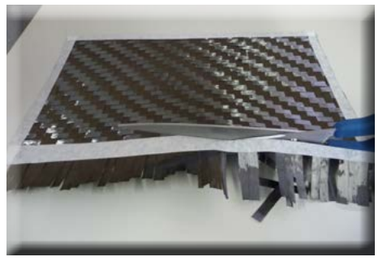
The coating

Step 1: Cut carbon fabric

The fabric must be made to measure!
Before the actual coating, the fabric should be laid out on a trial basis or worked with a template.

Our scissors are suitable for cutting (except for aramid fibers).
To prevent fraying, it can be covered with adhesive tape (e.g. „painter‘s mask“) in the later invisible area. When cutting through this tape, the fabric will not fray.

Materials: Carbon fabric (overview page18)
Tools: scissors, masking tape for masking off



Carbon fabric cut to size (taped)

Carbon fabric in rolls

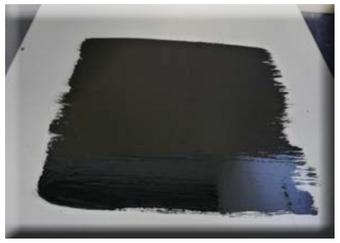
Step 2: Apply primer

The primer must be mixed according to the data sheet (here 100:50).
Immediately afterwards, the primer can be applied thinly with a brush.
Before the epoxy resin is applied, the adhesion promoter must be cured. (approx. 5h at 40°C)

► Details can be found in the technical data sheet.

Materials: Carbon fabric (overview page 18)
Tools: Brush or laminating rollers, ink tray

adhesion agent

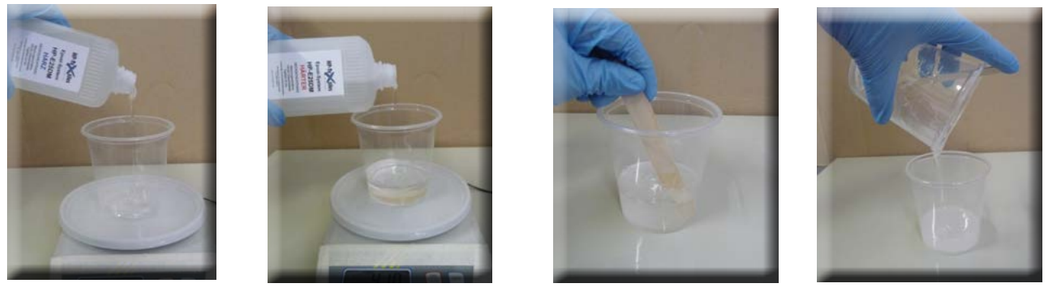


Step 3: Mix epoxy resin

First, the resin component must be weighed out in a suitable mixing cup.
Subsequently, the required amount of hardener should be added (taking into account the specified mixing ratio).

After mixing, the batch is now transferred to a second mixing cup and carefully stirred again.

Materials: Epoxy resin (overview page 8)
Tools: nitrile gloves, mixing cup, paint tray, stirring rods, painter‘s mask, scales



First weigh out the resin and then add the hardener. Stir well with a spatula and then transfer to another cup and stir well again.

Epoxy mixing video

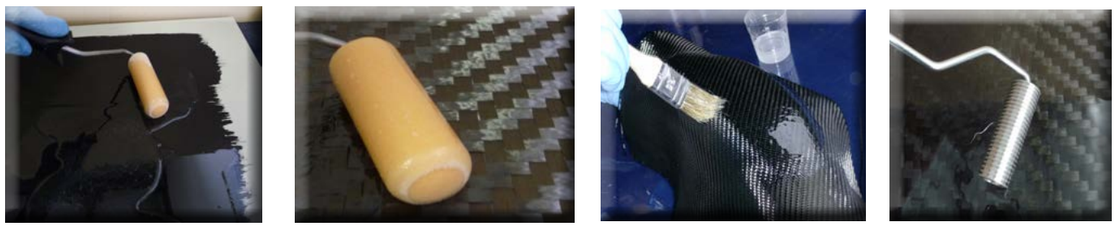
Step 4: Laminate

The mixed resin can now be applied with a brush or thin roller.

The fabric is then applied and rolled in with the deaeration roller so that it is completely embedded in the resin.

For complicated geometries, the material can also be dabbed with a brush.
It is essential to work carefully here and avoid displacements in the mesh!

Materials: Epoxy resin (overview page 8)
Tools: brush, deaeration roller, lamination roller



The epoxy laminating resin is applied with a flocked foam roller or brush. The fabric is then applied and thoroughly saturated. Air bubbles are removed with a deaeration roller.

Step 5: Peel Ply Fabric

When the entire fabric is saturated and there are no more air bubbles on the component, a peel ply is applied.

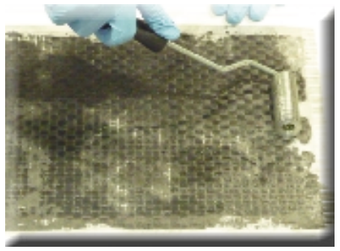
This should protrude generously to the sides and be rolled onto the still damp surface (> 10cm).

The peel ply should always be applied in one piece, otherwise there is a risk that irregularities caused by the transitions will spoil the subsequent appearance. After curing according to instructions (see resin data sheet), the peel ply can be carefully peeled off at an acute angle.

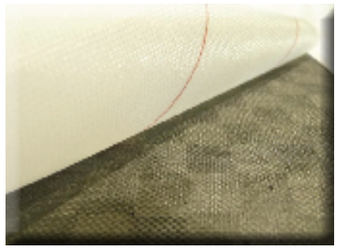
Once this has been done, the protruding, cured laminate can be cut off.
If there are minor defects or bumps in the laminate, these can be carefully sanded (240 grit or finer).

It is essential to ensure that the fabric is not damaged!

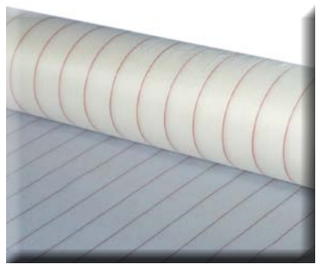
Materials: peel ply (plain or twill)
Tools: scissors



The peel ply absorbs excess resin. A deaeration roller for careful impregnation should be used.



Once the laminate has cured, the peel ply can be removed. What remains is a uniformly rough surface.



...peel ply
- never sand again!

Peel ply tips

Step 6: Apply epoxy top coat resin

After removal of the peel ply, a uniformly roughened surface remains. This is then coated again with an epoxy resin so that the carbon fabric is completely enclosed in the epoxy resin at the end.

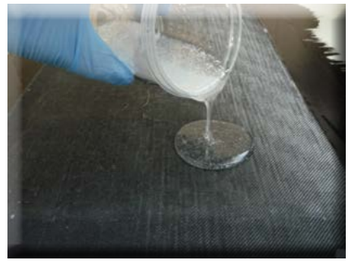
The mixed epoxy resin is carefully distributed with a velour roller. If necessary, this process must be repeated several times „wet-on-wet“ to produce a homogeneous layer or to improve any imperfections. Residual unevenness can be sanded with fine grit after complete curing.

Air bubbles can be avoided by adding 0.2 - 0.8% Deaerator HP-BEL51 (based on the total mixture).

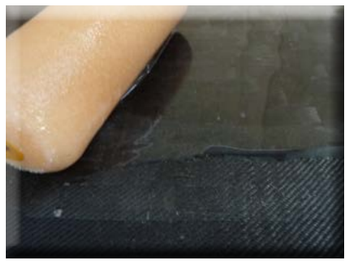
Important: in the case of several layers of top coat resin, work should be carried out „wet-on-wet“. In this case, the bottom resin layer should merely gelatinize so that it does not come off again when the next layer is applied. The gelled epoxy resin is slightly sticky, like the back of an adhesive tape.

Under no circumstances should you wait until the first layer has completely cured!

Materials: epoxy resin, deaerator
Tools: brush or laminating roller



Epoxy resin is poured onto the carbon fabric



Epoxy resin is distributed with velour roller

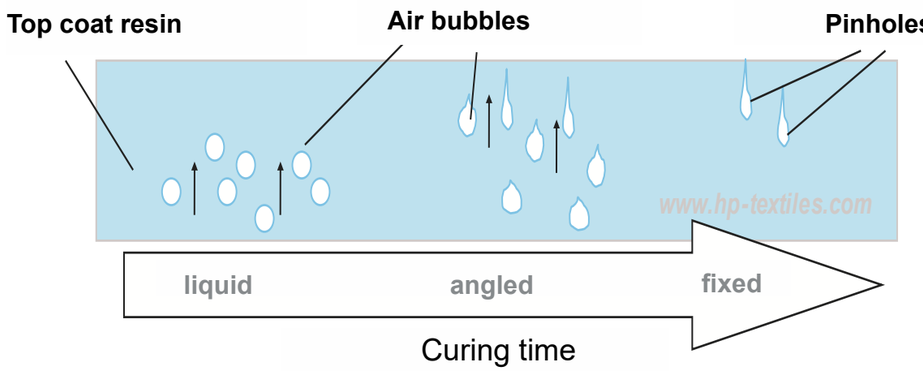
Ready laminated exterior mirrors

IMPORTANT: Avoid / remove air bubbles !

The top coat in particular should be as bubble-free as possible.

Air bubbles not only spoil the appearance - the components can also no longer be painted without bubbles!
In addition to the directly visible air bubbles, so-called „pinholes“ can also cause problems.

These are very small air bubbles that have become „stuck“ just below the surface towards the end of the curing phase.
They often only become visible when the laminate is finely sanded before painting.



Formation of so-called pinholes due to rising air pockets.

Tips:
1 The system deaerator (HP-BEL51) can be used to prevent and reduce air bubbles.
2. Pinholes can be avoided by briefly blow-drying the freshly applied resin and thus causing the last air bubbles to burst!
3. Our bubble-free atomizer (HP-BEL61) can be used to remove air bubbles! Spray 1-2 times on the still liquid epoxy and the bubbles are gone.

Step 7: Apply clear coat

This provides a better gloss and improves UV resistance. Before application, the fully cured surface should be carefully finished with increasingly fine sandpaper.

You can start here with a grit size of approx. 320 up to a finer grit size (e.g. 800).

Then clean and degrease the surface again.
Carefully mix the resin and hardener in the specified ratio (100:25) with a suitable stirrer until bubble-free.

	Resin	Hardener	PUR thinner
Mixing ratio (parts)	100	25	10-20
Pot life (at 20°C)	approx. 3 hours		
Processing temperature (optimal)	18 - 25°C		
Surface smoothness	from 15°C and up to 70% relative humidity		

Allow the batch to stand for 10 minutes before processing to allow any bubbles to escape. Then process within the pot life.
Spray application is recommended for high grades.

Diameter of spray nozzle: approx. 1.2 - 1.4mm, HVLP approx. 1.3 - 1.4mm
Spray pressure: approx. 4bar, HVLP approx. 2 - 2.5bar
Spray passes: 2 - 3 (recommended)
Recommended film thickness: 40 - 50µm (per coat)
Yield: 1 liter mixture approx. 7m² at 50µm

Application with a velour roller and subsequent sizing is also possible.
Electrostatic processing (ESTA) is also possible.

We recommend a paint test with subsequent adhesion test!

Materials: clear coat, thinner
Tools: paint compressor incl. accessories or laminating rollers, mixing cup, paint tray

Alternatively, use our clearcoat for spraying:
It is a transparent, universal and fast-drying clear coat. Protects against corrosion and UV light and is also scratch, impact and shock resistant. Suitable for metal and wood surfaces, as well as for paintable plastics with high functionality on the epoxy resins.

Our products

Complete set for carbon coating

HP-KS-CB (S.5)
- Topcoat system: HP-E25DM
- Carbon farbic: HP-T200C
- Paint and Varnish Set (10 pcs.): HP-L1001

Preparation

- Acetone: HP-AC
- Sanding Sponge: HP-SS

Acetone HP-AC

Step 1: Cut fabric

- Fabric (Selection S. 18)
- Scissors: HP-L1054 / HP-L1055
- if necessary Spray adhesive: HP-FIX400

Spray adhesive HP-FIX400

Step 2: Apply primer

- Primer-adhesion agent: HP-UC-9004
- Scissors: HP-L1054
- Laminating rollers: e.g. HP-L1015
- Plastic resin tray: e.g. HP-L301

Primer-adhesion agent HP-UC-9004

Step 3: Mix epoxy resin

- Epoxy resin overview s. S. 8
- Nitril-Gloves: HP-L1095
- Plastic cup: HP-L1063 / HP-L1064
- Plastic resin tray: e.g. HP-L301
- Wood spatula: HP-L1061 or Stirrer HP-L1051
- Table Scale: HP-VZ3010

Table Scale HP-VZ3010

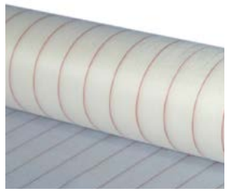
Step 4: Laminate

- selected epoxy resin
- Laminating brush: HP-L1071
- Radius roller: e.g. HP-RR-13x75
- or Laminating rollers: HP-L1015, -L1066, -L1067

Plastic resin tray HP-L301

Step 5: Peel Ply hang up

- Peel Ply:
- Plain: HP-P83P
- Twill: HP-T105P
- Scissors: HP-L1054
- Sanding Sponge: HP-SS



Peel Ply HP-P83P

Step 6: Apply epoxy top coat resin

- Epoxy Resin
- Degassing additive: HP-BEL51
- Laminating brush: HP-L1071
- or Laminating rollers: HP-L1015, -L1066, -L1067
- Bubble-free-Atomizer: HP-BEL61

Degassing additive HP-BEL51

Bubble-free-Atomazier HP-BEL61

Step 7: Apply clear coat

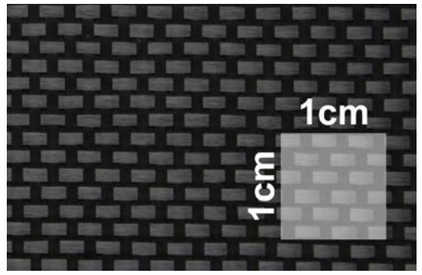
- Top Coat: HP-PUR
- Thinner: HP-IMC-X
- Laminating rollers: HP-L1015, -L1066, -L1067
- Plastic cup: HP-L1063 / HP-L1064
- Plastic resin tray : HP-L301

Top Coat HP-PUR

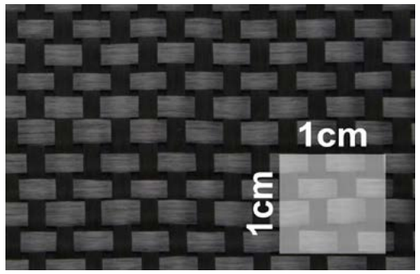
Tools

Selection carbon fabric

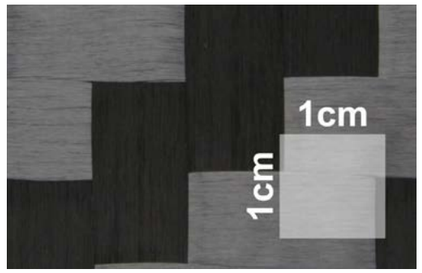
HP-P80C
1K 80g/m²
Plain



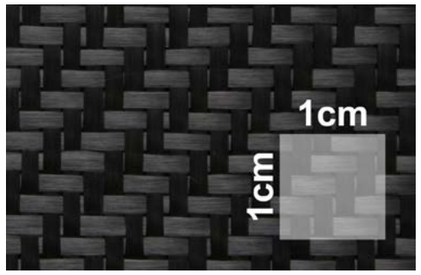
HP-P160C
3K 160g/m²
Plain



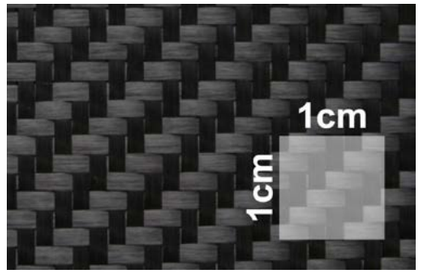
HP-T193C
12K 193g/m²
Twill 2/2



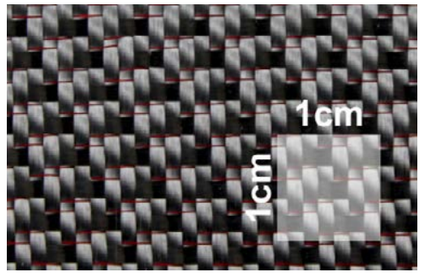
HP-T200C
3K 200g/m²
Twill 2/2



HP-T240C
3K 245g/m²
Twill 2/2



HP-T285C
285g/m²
Twill 2/2
available in different colors



More information

In our video and download portal of our online store www.hp-textiles.com/shop, various working instructions and videos on different topics are available.
Some examples are listed here and can be conveniently accessed via the QR code.

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