GPC1

Grooved & Perforated

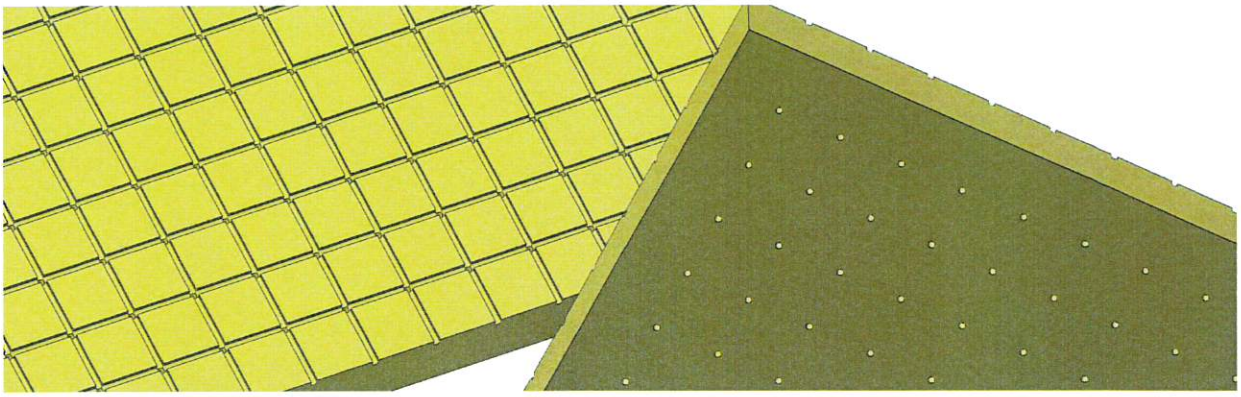


Figure 1: GPC1 top view (left picture) and bottom view (right)

MAIN FEATURE: DISTRIBUTOR

GPC1 is an attribute to our core materials, developed to make the infusion process reliable, fast and robust on flat or slightly curved surfaces, while imprints on the surface are minimized.

DESCRIPTION

As shown above, one side of the core is grooved and perforated, while the other side has perforations only.

Typical measurements	
Center-to-center perfs	20mm
Depth (D)	2mm
Width (W)	2mm
Perforation (Ø)	2mm

BENEFITS

- Reduces cost
- Saves labor
- Big process window
- Minimizing the risk of print troughs from the core
- Facilitating easy and fast lay-up of infusion strategy

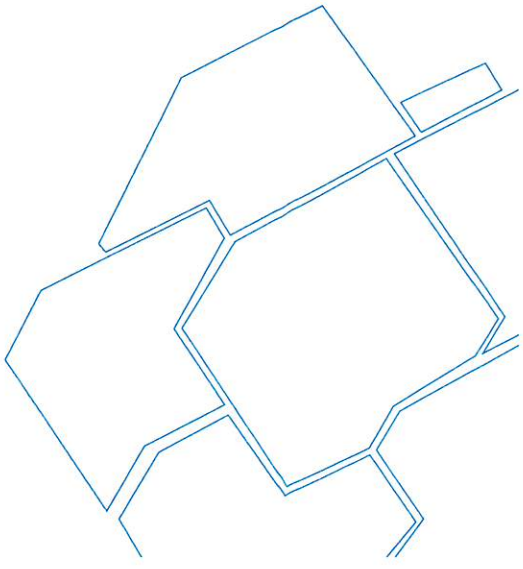
In addition to excellent infusion characteristics, GPC1 also has economical benefits since there is no need for additional infusion materials. For example, flow meshes or flow mats, are not needed due to the effective grooving and perforating of the core. Due to its fast flow, the distances between feeder lines are not as critical as without its configuration. This means that there are a lot of savings both in labor, materials and consumables compared to other infusion methods.

Peel plies are seldom used in combination with GPC1 since the added value is minor. However, it might occasionally be used to facilitate an easier grinding prior to secondary bonding or to get a smoother surface

TYPICAL APPLICATIONS

- Decks
- Top sides
- Hulls
- Panels
- Webs
- Stiffeners

GPC1 is very well suited for flat applications where efficiency and large volumes are important. It is true in particular where the core thickness is 20mm or less and there is a need for good finish on one side of the application.



PROCESS CHARACTERISTICS

- Good wet-out
- Robust
- Fast
- Reliable

The size of the grooves and perforations enable both low and high viscosity resins to flow securely to both sides of the core which means that GPC1 is both reliable and fast when used in an infusion process.
The design of the grooves (width, depth and distance between them) in combination with the perforations yields a fast flow and a proper saturation of fibers and core surface, which secures a good bond line.
The purpose of the perforations is to ensure a good transfer of resin to both sides of the core. A further advantage is that the infusion feeder lines can be positioned where it is most strategically appropriate, independent of the core sheet position.
As mentioned earlier, another important benefit with perforations is that it yields less print through from resin shrinkage compared to having grooves facing the outer surface.

LIMITATIONS AND CONSIDERATIONS

Resin consumption increases with thickness, due to perforations.
GPC1 is intended for flat surfaces[1].

FINISHING SOLUTIONS

Diab utilizes a combination of its complete range of finishing options to provide an optimized solution based on customers' requirements and objectives.
Should the standard range not fulfill the needs, tailor made cuts and solutions can be defined and developed. Normally this is not needed as the range of options and Diab competence covers majority of needs in various industries.

KITS

To fully optimize the application for cost, performance and quality Diab can engineer and design a core kit delivered in lay-up sequence. The kit of precut pieces is optimized for mechanical requirements, lay-up, manufacturing process, cost and quality objectives. The kit is produced by our skilled personnel using a combination of traditional and CNC equipment to achieve the desired result.

By working with kits our customers gain access to the full competence of Diab in terms of engineered design, core materials and range of manufacturing techniques, all having a profound impact on the ability to reach the objectives of the application from cost, quality and performance point of view.

1. In combination with another finishing code, for example GS30, GPC1 may be used also for applications with a curved surface.

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GS30 (GSC30)

Grid Scored

Main feature: Formable

GS30 is a grid scored material in two directions, which makes it formable and flexible for use in curved molds or applications.

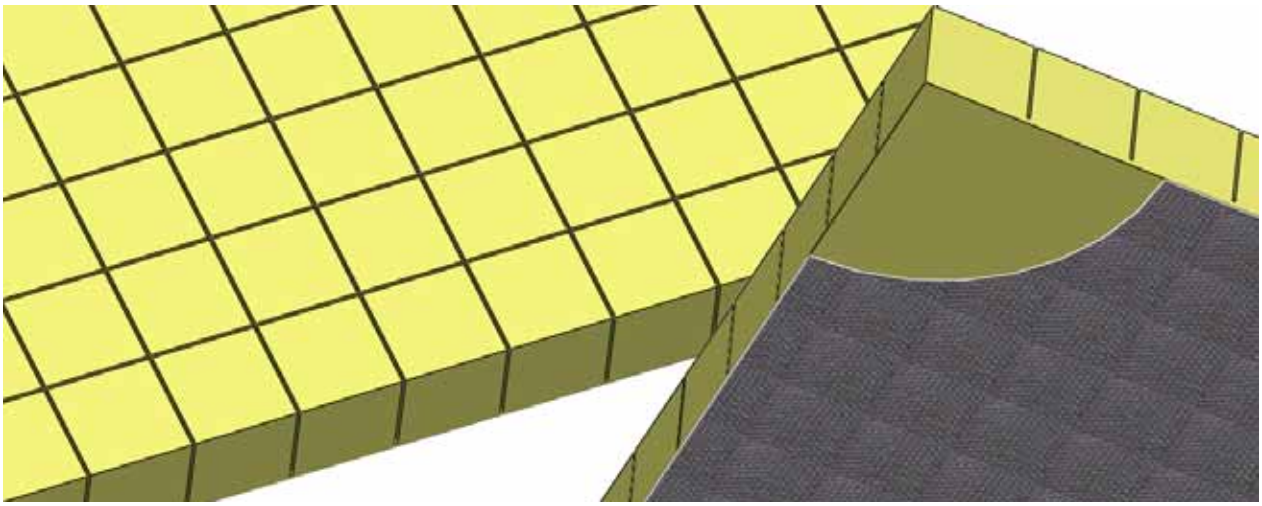

Figure 1: GS30 top view (left picture) and bottom view (right)

Description

The sheet has V-shaped cuts in length and width direction of the sheet almost all the way through the core. To reinforce the sheet a light weight fiberglass scrim is used on the opposite side of the cuts.

Typical measurements:	
Center-to-center	30mm
Depth (D)	~2mm from bottom of sheet
Width (W)	~0.9 U-shaped cut

Benefits

- Easy and robust to handle
- Multipurpose suitability
- Core bedding vacuum bonding
- Formable

GS30 is probably one of the most commonly used and appreciated finishes due to its flexibility and easy to use characteristics.

The most common way to assemble grid scored materials in a curved mold is to allow the grid scores to close, in a concave (female) mold - the cuts faces the operator. This has the following benefits:

- Reduces resin uptake
- Decreases resin shrinkage - less surface printing
- Reduces exothermic temperature

Typical applications

- Blades
- Nacelles
- Hulls
- Superstructures
- Tanks
- Etc.

GS30 is used in numerous of applications due to its “easy to use characteristics” and it conforms and shapes itself in a smooth manner.

Process characteristics

Suitable for curved surfaces, whether your manufacturing method is hand laminating, vacuum bonding or infusion.

The grid score grooves are only for curvature and should not be confused with infusion grooving.

It is very commonly used in hand lay-up or sprayed lay-up processes. In wet lay-up techniques it is preferred to wet prime the core before putting it down in a laminate, which preferably is a chopped mat bedding layer.

The proper and recommended method in wet lay-up manufacturing is to use a vacuum bonding technique combined with a suitable core bedding adhesive.

For infusion, additional finishing is needed, GS30 is a good choice where core bedding techniques are used, either it is through vibration or vacuum bagging techniques.

In infusion or other vacuum resin transfer molding processes GS30 is often combined with other finishing options to secure a good wet out of the surface of the core, alternatively flow meshes or flow mats are used in combination.

The preferred way to turn the GS30 down in a laminate or mold is to enable it to close the grid scores, which reduces resin uptake, decreases exothermic peaks and decreases risk of surface printing.

Limitations and considerations

If the core is placed correctly in the mold, as described in process characteristics, the grid scores will be closed or next to closed.

If the core is not placed correctly, the curvature grooves will be opened/widened, creating gaps which will be filled up with resin and creating race tracks in resin transfer molding processes.

Infusion resin consumption increases with thickness.

Finishing Solutions

DIAB utilizes a combination of its complete range of finishing options to provide an optimized solution based on customers' requirements and objectives. Should the standard range not fulfill the needs, tailor made cuts and solutions can be defined and developed. Normally this is not needed as the range of options and DIAB competence covers majority of needs in various industries.

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Q300 (GS30/PF)

Grid Scored & Perforated

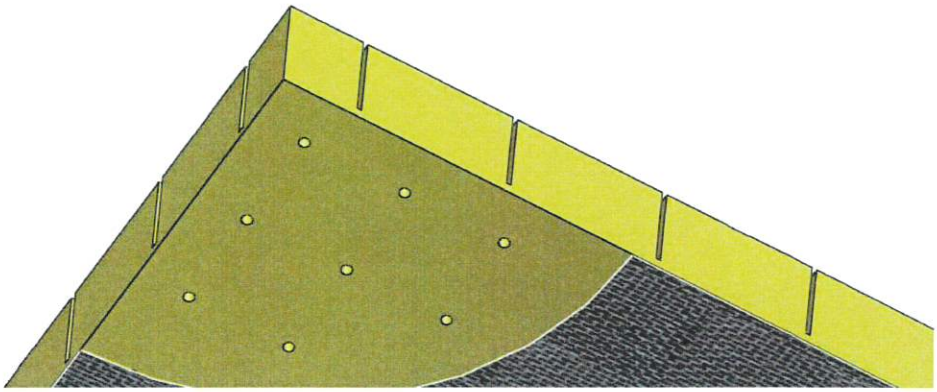


Figure 1: Q300

MAIN FEATURE: FORMABLE / DISTRIBUTOR

Q300 is a combined finishing code that creates new opportunities to meet specific production requirements. The combination between GS30 and PF allow a vacuum assisted resin transfer in curved geometries in a reliable, rapid and robust manner.

DESCRIPTION

The material is grid scored to allow the material to comform to the shape where it is applied to, perforations are added to fascilitatate air and resin transportation from one side of the core to the other.

Typical measurements	
PF	
Center-to-center perfs	20mm
Perforation (Ø)	2mm
GS30	
Center-to-center (c-c)	30mm
Depth (D)	~2mm from bottom of sheet
Width (W)	~0.9mm U-shaped cut

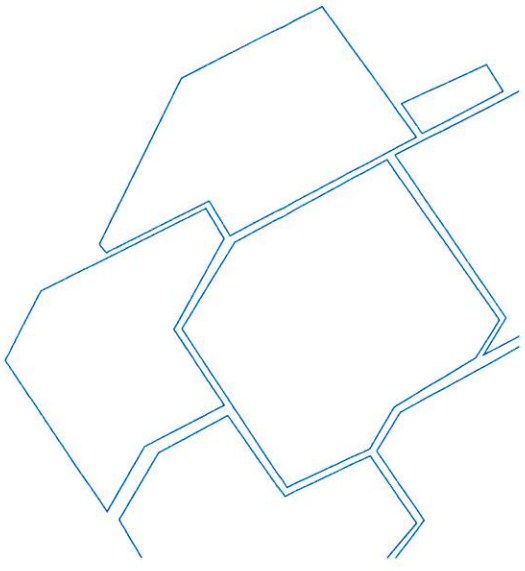
BENEFITS

- Reduces cost
- Saves labor
- Big process window
- Minimizing the risk of print troughs from the core
- Facilitating easy and fast lay-up of infusion strategy

TYPICAL APPLICATIONS

- Decks
- Top sides
- Hulls
- Blade shells

Q300 is very well suited for applications with curved surfaces. For very high surface finish demands a skin-coat or barrier coat is recommended.



PROCESS CHARACTERISTICS

- Good wet-out
- Robust
- Fast
- Reliable

The purpose of the perforations, caused by intersecting cuts, is to ensure a good transfer of resin to both sides of the core, usually from bagside of the core to the mold-side of the core. A further advantage is that the infusion feeder lines can be positioned where it is most strategically appropriate, independent of the core sheet position.
The preferred way to put the Q300 sheet down in a laminate or mold is to turn it so it closes the grid scores, which reduces resin uptake, decreases exothermic peaks and decreases risk of surface printing.

LIMITATIONS AND CONSIDERATIONS

Resin consumption increases with thickness of core.

Q300 is intended for curved surfaces only.

FINISHING SOLUTIONS

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