DELIVERING THE FUTURE OF COMPOSITE SOLUTIONS

CORE MATERIALS

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www.gurit.com
INTRODUCTION

Gurit is a technical leader in the development and manufacture of structural core materials. Cores in a sandwich construction are specified by designers and architects to increase stiffness and reduce the weight of a composite structure. Gurit has a range of core materials to fit any specification or manufacturing process. Structural core materials are offered in sheet form and with a variety of cut patterns or finishes, tailored to customer needs or processing choice.

**Gurit® Balsaflex™ END GRAIN BALSA WOOD CORE**

Gurit® Balsaflex™ is the classic end-grain balsa wood core, featuring very high strength to weight ratio and is available in range of densities, thickness and format/finish. Gurit® Balsaflex™ is approved by Germanischer Lloyd (GL) / Det Norske Veritas (DNV).

**Gurit® Corecell™ SAN STRUCTURAL FOAM**

Gurit® Corecell™ is a structural foam core material using a SAN (styrene acrylonitrile) polymer base featuring high toughness and impact resistant characteristics. Gurit® Corecell™ has become widely accepted for the construction of large, high performance structures through a wide range of processing methods.

**Gurit® Kerdyn™ Green THERMOPLASTIC RECYCLED FOAM CORE**

Gurit® Kerdyn™ Green is an up to 100% recycled PET content structural foam. Offering a perfect solution for application requiring a good balance of mechanical performance, top-in-class resin uptake performance as well as a more sustainable approach to the lightweight composite sandwich solution. With highly adaptable and recyclable capabilities, this thermoplastic PET (polyethylene-terephthalate) core material provides an adequate solution with a wide range of applications and processes.

**Gurit® PVC & Gurit® PVC HT CROSS-LINKED PVC FOAM**

Gurit® PVC is a closed cell, cross-linked PVC (polyvinyl chloride) foam. It provides high strength to weight ratio for all composite applications. Other key features of Gurit® PVC include outstanding chemical resistance, low water absorption and excellent thermal insulation capabilities. The HT option offers high temperature processing up to 140°C.
### Gurit’s Range of Structural Core Materials

<table>
<thead>
<tr>
<th>Product</th>
<th>Main Features</th>
<th>Shear</th>
<th>Compression</th>
<th>Dynamic</th>
<th>Fire, Smoke &amp; Toxicity</th>
<th>Processibility</th>
<th>Compatibility</th>
<th>3rd Party Certifications</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PET</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Gurit® Kerdyn™ Green |  - Up to 100% recycled PET content  
- All-purpose foam  
- Suitable for all sandwich applications  
- Superior strength & stiffness:weight  
- Outstanding chemical resistance  
- FR version | | | | | | | | | 6 |
| **PVC** |               |       |             |         |                        |                |               |                          |      |
| Gurit® PVC |  - All-purpose foam  
- Suitable for all sandwich applications  
- Superior strength & stiffness:weight  
- Outstanding chemical resistance  
- Self Extinguishing | | | | | | | | | 7 |
| Gurit® PVC HT |  - High temperature processing up to 140°C  
- Superior strength & stiffness:weight  
- Outstanding chemical resistance  
- Self Extinguishing | | | | | | | | | 7 |
| **SAN** |               |       |             |         |                        |                |               |                          |      |
| Gurit® Corecell™ T |  - Industrial grade structural foam  
- Superior strength & stiffness:weight  
- Low density  
- Cost-effective | | | | | | | | | 8 |
| Gurit® Corecell™ M |  - High performance foam, ideal for marine applications  
- High shear strength and low density  
- Excellent mechanical properties  
- High elongation for toughness  
- Self Extinguishing | | | | | | | | | 8 |
| Gurit® Corecell™ S |  - Sub-sea buoyancy foam  
- Excellent mechanical properties  
- High elongation for toughness  
- Self Extinguishing | | | | | | | | | 9 |
| **Balsa** |               |       |             |         |                        |                |               |                          |      |
| Gurit® BalsaFlex™ |  - Classic wood core  
- Available in typical densities & formats  
- Very high mechanical properties  
- Sustainability and reusability excelled | | | | | | | | | 9 |

Key:  
- Fair  
- Good  
- Excellent  
- Outstanding

PRU = Panel Resin Uptake  
VE = Vinylester  
PE = Polyester  
EP = Epoxy

* Please contact your local sales representative for further information on the products.
### Gurit® Kerdyn™ Green

<table>
<thead>
<tr>
<th>Density</th>
<th>Foam/Colour</th>
<th>Nominal Density (kg/m³)</th>
<th>Half Sheet Size (mm)</th>
<th>Nominal Sheet Size (mm)</th>
<th>Unbonded Thickness (mm)</th>
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</thead>
<tbody>
<tr>
<td>80</td>
<td>Blue</td>
<td>80</td>
<td>1005 x 1220</td>
<td>39.5 x 48</td>
<td>5-200</td>
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<tr>
<td>110</td>
<td>Green</td>
<td>110</td>
<td>120 x 1220</td>
<td>47 x 48</td>
<td>6-175</td>
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<tr>
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<td>Black</td>
<td>135</td>
<td>1220 x 1220</td>
<td>48 x 48</td>
<td>6-150</td>
</tr>
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<td>Orange</td>
<td>190</td>
<td>1220 x 1220</td>
<td>48 x 48</td>
<td>6-100</td>
</tr>
<tr>
<td>250</td>
<td>Black</td>
<td>250</td>
<td>1220 x 1220</td>
<td>48 x 48</td>
<td>6-80</td>
</tr>
<tr>
<td>300</td>
<td>Orange</td>
<td>300</td>
<td>1220 x 1220</td>
<td>48 x 48</td>
<td>6-60</td>
</tr>
</tbody>
</table>

**PLEASE NOTE:** Maximum unbonded thicknesses can vary across Gurit sites. Please contact your local sales representative for more information.

### Gurit® Corecell™ T400

<table>
<thead>
<tr>
<th>Density</th>
<th>Short Edge Marking</th>
<th>Nominal Density (kg/m³)</th>
<th>Half Sheet Size (mm)</th>
<th>Nominal Sheet Size (mm)</th>
<th>Unbonded Thickness (mm)</th>
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</thead>
<tbody>
<tr>
<td>40</td>
<td>White Green</td>
<td>40</td>
<td>1285 x 1295</td>
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<td>3-130</td>
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<tr>
<td>49</td>
<td>White Blue</td>
<td>49</td>
<td>1195 x 1220</td>
<td>47 x 48</td>
<td>3-120</td>
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<tr>
<td>60</td>
<td>Yellow Green</td>
<td>60</td>
<td>1285 x 1295</td>
<td>50.5 x 49.5</td>
<td>3-100</td>
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<td>Pink</td>
<td>80</td>
<td>1220 x 1220</td>
<td>48 x 48</td>
<td>3-80</td>
</tr>
<tr>
<td>100</td>
<td>Red</td>
<td>100</td>
<td>1220 x 1220</td>
<td>48 x 48</td>
<td>3-60</td>
</tr>
<tr>
<td>120</td>
<td>Brown</td>
<td>120</td>
<td>1220 x 1220</td>
<td>48 x 48</td>
<td>3-40</td>
</tr>
<tr>
<td>135</td>
<td>Yellow Blue</td>
<td>135</td>
<td>1285 x 1295</td>
<td>50.5 x 49.5</td>
<td>3-35</td>
</tr>
<tr>
<td>150</td>
<td>Red Brown</td>
<td>150</td>
<td>1205 x 1015</td>
<td>40 x 40</td>
<td>3-25</td>
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<td>200</td>
<td>Brown</td>
<td>200</td>
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<td>36 x 36</td>
<td>3-20</td>
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<td>765 x 765</td>
<td>31 x 31</td>
<td>3-15</td>
</tr>
</tbody>
</table>

**PLEASE NOTE:** Maximum unbonded thicknesses can vary across Gurit sites. Please contact your local sales representative for more information.
**Gurit® Kerdyn™ Green**
Recycled Structural Foam

<table>
<thead>
<tr>
<th>Recyclable</th>
<th>DNV-GL certified</th>
<th>FR version</th>
</tr>
</thead>
</table>

- Up to 100% recycled PET content
- Improved mechanical properties
- Recyclable
- Compatible with all types of composite manufacturing techniques

Gurit® Kerdyn™ Green is a new recyclable, thermoplastic foam with an improved balance of mechanical properties, enhanced resin uptake performance, and good temperature resistance for a wide range of applications and production processes.

**TYPICAL APPLICATIONS**
Gurit® Kerdyn™ is used extensively in wind turbine blades, civil and marine structures. Gurit® Kerdyn™ is available in plain sheet form. A fire retardant version is also available with certification under review.

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**Gurit® PVC & Gurit® PVC HT**
All-Purpose Foam Core

<table>
<thead>
<tr>
<th>High Chemical Resistance</th>
<th>DNV-GL, Lloyd’s &amp; RINA approved</th>
<th>High Process Temperature</th>
</tr>
</thead>
</table>

- Suitable for all composite sandwich applications
- Outstanding chemical resistance
- Superior strength and stiffness to weight ratio
- Self extinguishing
- High temperature resistance up to 140°C with Gurit® PVC HT

Gurit® PVC is a closed cell, cross-linked PVC foam. It provides superior strength to weight ratio for all composite applications. Other key features of Gurit® PVC include outstanding chemical resistance, negligible water absorption, and excellent thermal insulation capabilities. It is compatible with most common resin systems including epoxy, polyester and vinylester.

Gurit® PVC is available in a wide range of formats with all standard cut patterns and finishes possible.

**TYPICAL APPLICATIONS**
Gurit® PVC is an all purpose core and can be used in decks, hull sides, bulkheads, floors and wind turbine blade shells.
Gurit® Corecell™ T
Structural Foam Core

- Suitable for all PVC core applications
- Outstanding chemical resistance
- Ideal for resin infusion
- Excellent mechanical properties
- 120°C processing

Gurit® Corecell™ T has been developed as a technological step-change from traditional PVC and Balsa structural core. Gurit® Corecell™ T is an outstanding core material in every application where balsa or cross-linked PVC is commonly used. High mechanical toughness and thermal stability give Gurit® Corecell™ T excellent fatigue characteristics. This reliability makes Gurit® Corecell™ T a natural replacement for cross-linked PVC or balsa in applications where a significant service life is required.

The high temperature stability of Gurit® Corecell™ T also means that it can be used in manufacturing processes to at least 120°C / 250°F with short durations during a cure cycle to over 150°C / 300°F. This makes it ideal for use with conventional prepregs and in some liquid infusion processes where high resin exotherms can often be seen. Gurit® Corecell™ T is available in every resin infusion format and is compatible with polyester, vinylster and epoxy resin systems. Low resin absorption characteristics of Gurit® Corecell™ and unique knife cut formats allow for higher performing infusions, lower resin cost and lower weight than any other structural core.

**TYPICAL APPLICATIONS**
Ideal for applications where loads are less dynamic in nature, such as above the waterline on yachts, on wind turbines and in mass transport.

Gurit® Corecell™ M
The Marine Foam

- Low resin absorption
- High temperature processing (prepreg compatible)
- High shear strength & elongation – ideal for areas subjected to slamming loads
- Good compressive strength and stiffness
- DNV-GL, RINA, BV, Lloyds & RINA approved
- Suitable for prepreg, SPRINT®, infusion and wet lamination

Gurit® Corecell™ M has been developed to deliver one product for all marine applications. It provides a combination of high shear strength with low density, high elongation, high temperature resistance and low resin uptake. Gurit® Corecell™ M is the perfect choice whether your application is slamming area or superstructure, hull or deck, using hand lamination, infusion or prepreg.

**TYPICAL APPLICATIONS**
Gurit® Corecell™ M is used for wind turbine blades and nacelles, marine, automotive, truck, rail and aircraft parts. Gurit® Corecell™ M can be supplied in sheet form or kit-cut to customer’s desired shapes.

Gurit® Balsaflex™
Classic Wood Core

- High quality composite core material made from end grain balsa
- Highest strength to weight ratio of any structural core
- Natural, sustainable and responsibly sourced
- Suitable for prepreg, wet lamination, SPRINT®, infusion and SPRINT® and Balsaflex™ certified
- DNV-GL certified
- High strength to weight ratio

Gurit® Balsaflex™ is the classic end-grain balsa wood core, featuring very high strength to weight ratio. When an application requires high-strength and stiffness and cost effectiveness, Gurit® Balsaflex™ is a suitable solution due to a good balance between cost, properties and weight. Gurit® Balsaflex™ is available in a range of densities, thicknesses, formats and finishes. Gurit® Balsaflex™ is GL approved.

**TYPICAL APPLICATIONS**
Gurit® Balsaflex™ is used for wind turbine blades and nacelles, marine, automotive, truck, rail and aircraft parts. Gurit® Balsaflex™ can be supplied in sheet form or kit-cut to customer’s desired shapes.

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**Gurit® Corecell™ S**
Sub-sea Foam

- Sub-sea buoyancy foam
- Ultra-fine cell size
- Outstanding mechanical properties
- Lower density than resin-based syntactics
- High hydrostatic crush strength and water resistance

Gurit® Corecell™ S has been designed specifically for use in sub-sea buoyancy applications. Its resistance to crushing means that it can withstand depths of over 900m, and its closed-cell structure gives it a high water resistance that ensures buoyancy is maintained over time. With its very high compressive strength, Gurit® Corecell™ S can also replace other materials, such as plywood, when creating high strength inserts for through-bolting in composite laminates.

**TYPICAL APPLICATIONS**
Gurit® Corecell™ S has been used in a variety of demanding sub-sea applications from buoys, civil and military submarines as well as highly loaded marine applications units. Gurit® Corecell™ S can be supplied in sheet form or kit-cut format. This is a Gurit special product.
INTRODUCTION
Gurit standard product forms are described in the following tables toward faster response. Gurit can also tailor sheets to your own specification depending on lead-time and volume - please call to discuss your requirements.

PL – Plain Sheet – Optimum material properties. Limited bending in-mould.
PH – Plain with Bleeder Holes – Assists air release in vacuum bag processes.

CUTS FOR CONFORMABILITY (FOAM)
Gurit double-cut finish is standard for Gurit® Corecell™ and Gurit® Kerdy™ Green; and can be also considered for Gurit® PVC. Alternatives single-cut or the less common triple-cut can also be performed. Please be advised that cuts are dependent upon the density and thickness of the material. Higher density and thickness materials may need to be saw cut (0,9/1mm), rather than knife cut 0,5mm although the spacing will be constant. Knife cuts are not visible when the sheets lie flat and these narrow knife-cuts minimise overall resin consumption compared to saw-cut core finishes. Maximum sheet size is half of a full-size sheet. Please contact your customer support representative for more information.

SC – Single Cut – Provides flexibility in a single direction on one or both sides of a sheet. If done on both sides, the cuts intersect so no bleeder holes are necessary for vacuum bagging. Max sheet size is half of a full-size sheet.
DC – Double Cut – Provides flexibility in two directions on one or both sides of the sheet. If Double Cut on both sides, the intersecting cuts make DC a highly effective resin infusion medium. The cuts are not visible when the sheets lie flat and these narrow knife-cuts minimise unnecessary resin accumulations compared to sawn core materials.
CS – Contour Scrim – Provides optimum flexibility in two directions. Sheets are cut in squares and bonded to a glass scrim. Available on sheets up to 25mm (0.98”) thick (dependent on density). Maximum standard sheet size is half the full sheet.

SURFACE GROOVES FOR INFUSION (FOAM)
VIC – Vacuum Infusion Core – There are several VIC options and Gurit can customize groove patterns and bleeder holes as required. For curved laminates sections, double-sided DC is a very effective system for resin infusion with low weight gain. Heat-forming VIC surface cut also useful for obtaining curved panels with minimal resin uptake.
Combination – Combinations of these aforementioned formats are also available.

PRODUCT FORMATS (BALSA)
Gurit® Balsaflex™ is available plain or with typical formats including perforations, grooves, contour scrim and with optional coating.

OTHER PRODUCT FORMATS
Fillet strips – Triangular edge strips to create tapered panel edge drop-offs, or stringer base fillets.

FINISHING CONT’D
Complete Core Solutions

KITTING
Complete Core Solutions

INTRODUCTION
Gurit has an extensive kitting capability to provide all the Gurit® Corecell™ formats in customised, numbered, ready to use, CNC machined kits. Gurit can make comprehensive kits using either full customer drawings or their B³ SmartPlac software solution. All types of core can be supplied and machined including Gurit® Corecell™ (SAN), Gurit® PVC, Gurit® Kerdy™ Green and Gurit® Balsaflex™.

Gurit use either 5-Axis, or 3-Axis CNC machines along with a range of semi-automatic and manual machines to provide the optimum kitting solution depending upon kit complexity. Gurit has developed specific knowledge and experience on the correct flute and clearance angles to provide optimum cutting conditions. This allows for quick cutting to minimise cost, accurate cutting for component dimensions and fine cutting to allow the best nesting routines so maximising yield rates and minimising waste.

Gurit’s machining strategy for core is to develop a range of cutting techniques that provide a cost-effective and flexible kitting solution to satisfy customer requirements.

For details regarding the maximum window of capabilities related to core type, thickness and density, please contact your local Sales Team: www.gurit.com/contact.aspx
Gurit’s heritage lies in engineering high performance yachts such as Americas Cup, Open 60’s and Volvo 70’s. However, over the past 30 or so years, Gurit has been involved with almost every type of marine craft including military power boats, production cruisers, and some of the world’s most spectacular superyachts. Whilst Gurit is most widely recognised for its marine expertise, the team has considerable experience in the provision of innovative engineering solutions to many different structures.

The range of projects worked on covers any large composite structural application and includes:

- Raceboats
- Wind turbines
- Civil Engineering
- Superyachts
- Underwater turbines
- Architectural features

To show how different core materials are considered in industry, some of the challenges that designers face for superyachts and wind energy turbine blades are discussed below.

**SUPERYACHT DESIGN**

**Hulls**

The hull and deck shells of a boat provide the watertight safety cell for the crew and also the foundation to support the rig and keel.

The amount of pressure from the water that the hull of a yacht has to sustain varies along the length of the boat and also from the bottom to the shearline. Classification societies adopt a quasi-static analysis, which defines a hydrostatic pressure distribution. The hull bottom panels see higher pressure than the topside panels because they are submersed deeper in the water. The pressure distribution also decreases from the bow to the stern due to decreasing exposure to waves.

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**DECKS**

As superyacht length increases, boats get sleeker and the fore and aft bending stiffness becomes an increasing challenge, putting decks under increased compression loads.

For smaller size boats, deck stiffening tapes are added over the full width of the deck. The critical failure mode is likely to be Euler Buckling (Fig. 1 & 2). As boat size increases, the most common solution is to concentrate the deck tapes at the edges of the panel. This changes the critical failure mode from Euler Buckling of the overall side deck panel to shear crimping in way of the concentrated tapes (Fig. 3).

Decks also have to support water pressure and local indentation from walking loads and deck gear.
The diagram below shows a limited range of possible options. The Gurit Engineering Team will be available to support the adequate material selection and suitable design for your component.

**SOLES**

- **Gurit® Kerdyn™ Green 115**
- **Gurit® Corecell™ M 80**

- For low cost solution

- Where cosmetics are critical, e.g. dark coloured finish

- **Gurit® PVC 90**
- **Gurit® PVC 60**

- For low weight solution

- Where cosmetics are critical, e.g. dark coloured finish

- **Gurit® Kerdyn™ Green 100**
- **Gurit® Corecell™ M 100**

- Lowest cost, highest weight solution

- Where cosmetics are critical, e.g. light coloured finish

**SUPERSTRUCTURE**

- **Gurit® Kerdyn™ Green 100**
- **Gurit® Corecell™ M 100**

- Where cosmetics are critical, e.g. dark coloured finish

- **Gurit® PVC 80**
- **Gurit® Corecell™ M 80**

- For lower cost solution

- Where cosmetics are less critical, e.g. light coloured finish

**ENGINE**

- **Gurit® Kerdyn™ Green 200**
- **Gurit® Corecell™ M 200**

- In way of high point-loaded deck fittings & penetrations

- **Gurit® Kerdyn™ Green 115**

- Aft bottom shell

- **Gurit® Corecell™ M 130**

- For impact toughness

- Where topside cosmetics are critical, e.g. dark coloured finish

- **Gurit® PVC 100**

- For lower cost solution

- Where topside cosmetics are less critical, e.g. light coloured finish

**DECK FITTINGS**

- **Gurit® PVC 200 / 250**

- Inserted in way of through bolting areas e.g. engine or equipment mounts

- **Gurit® Corecell™ M 200**

- In way of high point-loaded deck fittings & penetrations

**BOLLARDS &**

- **Gurit® Kerdyn™ Green 200**
TECHNICAL INFORMATION

For more detailed information on core materials, as well as the complete Gurit product portfolio, please visit: www.gurit.com to view the following:

- Product Data Sheets
- Corporate Videos
- News / Case Studies
- Composite Guides
- Events Schedules
- Representatives Contact Details
- Product Brochures

For pricing or other enquires, please contact customer.support@gurit.com