

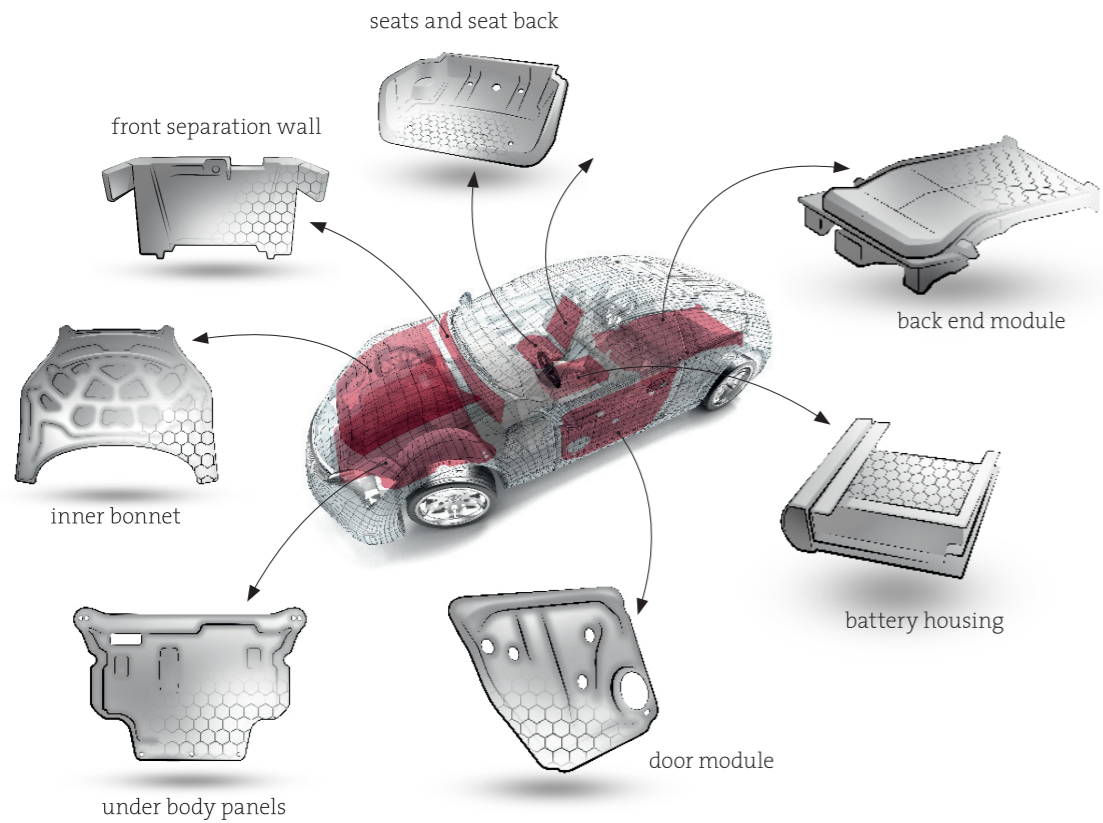
THERMHEX PP SANDWICH PANEL

The ThermHex PP sandwich panel production is based on the patented ThermHex process. The process enables the continuous inline production of thermoplastic honeycomb cores in a fully automatic production line.

By using our lightweight panel weight savings of over 80 % are possible compared to a monolithic construction. In comparison to a monolithic organosheet laminate, a sandwich of the same stiffness requires fewer layers of composite, which means considerable cost savings when using the ThermHex PP sandwich panel.

The panel consists of 0°/90° cross ply laminate skin layers (CP) made of continuous glass fiber reinforced polypropylene (GF/PP) and alternatively of skin layers from chopped glass fiber reinforced polypropylene (GC). The folded honeycomb core material consists of a polypropylene as well.

This allows an optimal bond between core and skin layers in the lamination process by thermoplastic welding. The sandwich can be compressed locally to form a monolithic laminate which enables the thermoforming of multi-curved shell structures and the formation of stable monolithic joining surfaces in one step. The pressed areas offer the possibility of functional integration by means of injection molding. Hence, complex lightweight parts can be produced very cost-efficiently in short cycle-times which is essential for many automotive applications.



Potential automotive applications



ADVANTAGES

- > Major cost reduction
- > Significant weight saving
- > High bending stiffness
- > Energy absorbent
- > Resistant to moisture, acids and bases
- > Easy resource-friendly converting
- > 100 % recyclable

THERMHEX PP SANDWICH PANEL THERMHEX POLYPROPYLENE HONEYCOMB CORE WITH GF/PP COMPOSITE SKIN



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Management System
ISO 9001:2015
ISO 14001:2015
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ThermHex Waben is a licensee of EconCore NV (Belgium), the technology leader for cost-efficient sandwich material production technologies.

LIABILITY FOR DEFECTS

All information provided herein is based on our current knowledge and experience. Due to the high number of possible influences during processing and application, the information does not release the processor from the necessity of carrying out his own investigations and tests. Information contained herein and explanations provided by ThermHex Waben GmbH in connection with this printed matter does not represent acceptance of a guarantee. Guarantee statements require special explicit written declarations on behalf of ThermHex Waben GmbH to be effective. The constitutions stated in this datasheet determine the properties of the delivery item extensively and conclusively. Application suggestions do not establish assurance of suitability for the recommended application.

We reserve the right to adapt the product to satisfy technical progress and new developments. We would be pleased to help with any enquiries including those related to special application issues. If the application for which our products are used is subject to statutory approval, the user is responsible for the procurement of such approval. Our recommendations do not release the user from the obligation of taking the possibility of impairments to third-party rights into account and of clarifying these if necessary. Furthermore we refer to our General Terms and Conditions, especially with regard to any possible liability for defects. If you are not in possession of our General Terms and Conditions we would be pleased to supply these on request.

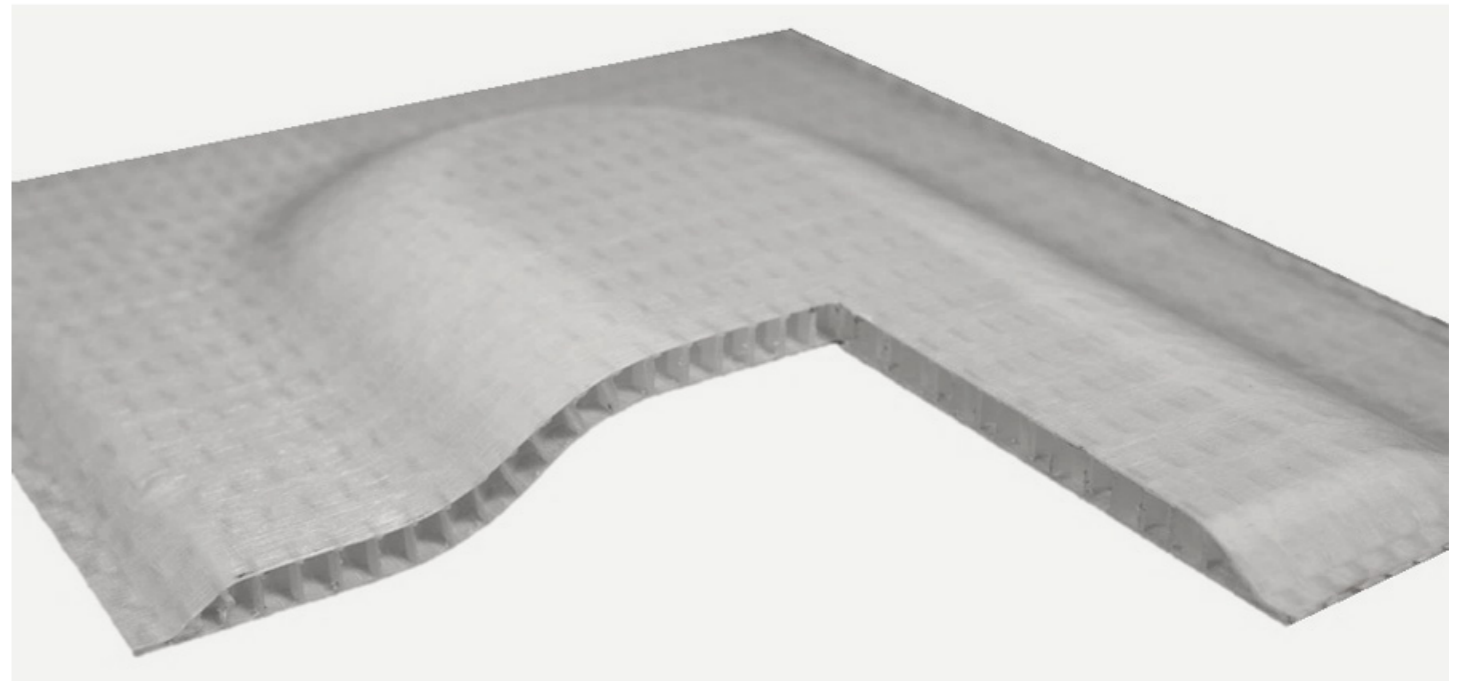


PRODUCT DESCRIPTION

Medium density ThermHex PP honeycomb with 820 g/m² crossply skins from PP/GF UD Tapes

| | 6THPP120-CP820 | 12THPP120-CP820 | 15THPP120-CP820 | 20THPP120-CP820 |
|---|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Sandwich thickness | 6 mm | 12 mm | 15 mm | 20 mm |
| Skin layer thickness | 0,5 mm | 0,5 mm | 0,5 mm | 0,5 mm |
| Core thickness | 5 mm | 11 mm | 14 mm | 19 mm |
| Cell size | 4 mm | 5 mm | 5 mm | 5 mm |
| Weight per unit area | 2450 g/m ² | 3200 g/m ² | 3590 g/m ² | 4240 g/m ² |
| Sandwich density | 400 - 410 kg/m ³ | 260 - 270 kg/m ³ | 235 - 245 kg/m ³ | 210 - 220 kg/m ³ |
| Core density | 120 - 130 kg/m ³ | 120 - 130 kg/m ³ | 120 - 130 kg/m ³ | 120 - 130 kg/m ³ |
| Bending stiffness (CD, L – MD, W) * | 140 – 125 Nm | 590 – 475 Nm | 900 – 600 Nm | 1600 – 700 Nm |
| Compressive strength (Z-direction) ASTM C365-57 | 2,0 MPa | 2,4 MPa | 2,4 MPa | 2,4 MPa |
| Compressive modulus (Z-direction) ASTM C365-57 | 60 MPa | 140 MPa | 140 MPa | 140 MPa |
| Shear strength (CD, L – MD, W) ASTM C273-61 | 1,2 MPa – 0,5 MPa | 1,2 MPa – 0,5 MPa | 1,2 MPa – 0,5 MPa | 1,2 MPa – 0,5 MPa |
| Shear modulus CD, L – MD, W) ASTM C273-61 | 50 MPa – 16 MPa | 50 MPa – 16 MPa | 50 MPa – 16 MPa | 50 MPa – 16 MPa |

* (at 400 mm span length in 3PB test)



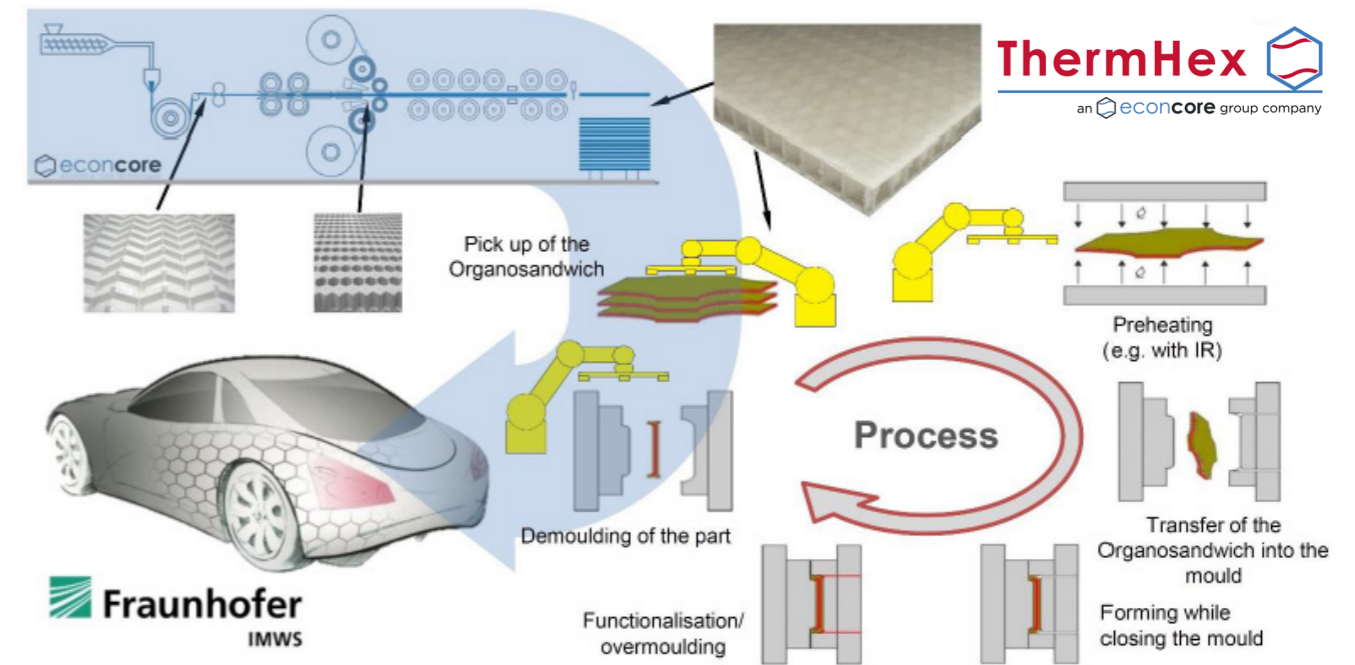
Picture: Fraunhofer IMWS

PRODUCT DESCRIPTION

Medium density ThermHex PP honeycomb with 580 g/m² crossply skins from PP/GF UD Tapes

| | 6THPP80-CP580 | 12THPP80-CP580 | 15THPP80-CP580 | 20THPP80-CP580 |
|---|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Sandwich thickness | 6 mm | 12 mm | 15 mm | 20 mm |
| Skin layer thickness | 0,4 mm | 0,4 mm | 0,4 mm | 0,4 mm |
| Core thickness | 5,2 mm | 11,2 mm | 14,2 mm | 19,2 mm |
| Cell size | 4 mm | 5 mm | 5 mm | 5 mm |
| Weight per unit area | 1700 g/m ² | 2240 g/m ² | 2510 g/m ² | 2960 g/m ² |
| Sandwich density | 280 - 290 kg/m ³ | 180 - 190 kg/m ³ | 165 - 175 kg/m ³ | 145 - 155 kg/m ³ |
| Core density | 80 - 90 kg/m ³ | 80 - 90 kg/m ³ | 80 - 90 kg/m ³ | 80 - 90 kg/m ³ |
| Bending stiffness (CD, L – MD, W) * | 90 – 70 Nm | 420 – 290 Nm | 600 – 400 Nm | 1000 – 420 Nm |
| Compressive strength (Z-direction) ASTM C365-57 | 1,2 MPa | 1,2 MPa | 1,2 MPa | 1,2 MPa |
| Compressive modulus (Z-direction) ASTM C365-57 | 25 MPa | 40 MPa | 40 MPa | 40 MPa |
| Shear strength (CD, L – MD, W) ASTM C273-61 | 0,5 MPa – 0,3 MPa | 0,5 MPa – 0,3 MPa | 0,5 MPa – 0,3 MPa | 0,5 MPa – 0,3 MPa |
| Shear modulus CD, L – MD, W) ASTM C273-61 | 15 MPa – 6 MPa | 15 MPa – 6 MPa | 15 MPa – 6 MPa | 15 MPa – 6 MPa |

* at 400 mm span length in 3PB test



PRODUCT DESCRIPTION

Medium density ThermHex PP honeycomb with 340 g/m² skins from PP/GF chopped strand mat

| | 6THPP80-GC340 | 12THPP80-GC340 | 15THPP80-GC340 | 20THPP80-GC340 |
|---|----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Sandwich thickness | 6 mm | 12 mm | 15 mm | 20 mm |
| Skin layer thickness | 0,25 mm | 0,25 mm | 0,25 mm | 0,25 mm |
| Core thickness | 5,5 mm | 11,5 mm | 14,5 mm | 19,5 mm |
| Cell size | 4 mm | 5 mm | 5 mm | 5 mm |
| Weight per unit area | 1220 g/m ² | 1760 g/m ² | 2030 g/m ² | 2480 g/m ² |
| Sandwich density | 200 - 210kg/m ³ | 140 - 150 kg/m ³ | 130 - 140 kg/m ³ | 120 - 130 kg/m ³ |
| Core density | 80 - 90 kg/m ³ | 80 - 90 kg/m ³ | 80 - 90 kg/m ³ | 80 - 90 kg/m ³ |
| Bending stiffness (CD, L – MD, W) * | 28 – 18 Nm | 110 – 80 Nm | 170 – 120 Nm | 320 – 220 Nm |
| Compressive strength (Z-direction) ASTM C365-57 | 1,2 MPa | 1,2 MPa | 1,2 MPa | 1,2 MPa |
| Compressive modulus (Z-direction) ASTM C365-57 | 25MPa | 40 MPa | 40 MPa | 40 MPa |
| Shear strength (CD, L – MD, W) ASTM C273-61 | 0,5 MPa – 0,3 MPa | 0,5 MPa – 0,3 MPa | 0,5 MPa – 0,3 MPa | 0,5 MPa – 0,3 MPa |
| Shear modulus CD, L – MD, W) ASTM C273-61 | 15 MPa – 6 MPa | 15 MPa – 6 MPa | 15 MPa – 6 MPa | 15 MPa – 6 MPa |

* at 400 mm span length in 3PB test



Picture: Fraunhofer IMWS/ Sven Döring

| | |
|------------------------------|--|
| Temperature range (°C) | - 30 to + 80; short term up to + 140 |
| Thermal conductivity W / m*k | 0,060 - 0, 070 |
| Fire-resistance | Normally inflammable, higher grades of fire-resistance can be obtained in sandwich elements when using specialized surface modification. |
| Chemical resistance | Excellent resistance to water, most acids, bases and salt solutions. |
| Standard dimensions | 1200 mm x 2500 mm |