3D|CORE™

3D|CORE™ FOAM IN NEW DIMENSIONS

Seite

ESC 3D|CORE™

3D|CORE™ – EXAMPLES OF USE

The impressive strength of the final product, with 3-D flexibility during the manufacturing process, is recommended for all applications where weight saving is important:

Boat building (deck)

Boat building (hull)

Car body construction

Personal protection

Airship (Zeppelin nose)

Aviation (gliding)

ESC 3D|CORE™

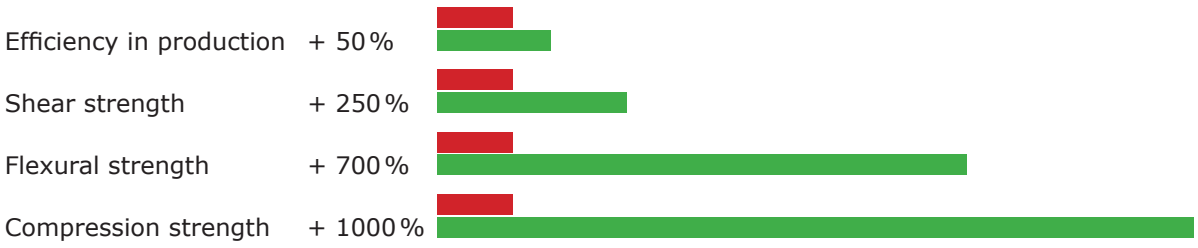
3D|CORE™ – BENEFITS AND FUNCTION

In search of a three-dimensionally mouldable technical foam core the ESC R&D team found, through comprehensive simulations and tests, a new way to combine drapebility and reinforcement in one product. Hexagonal foam bodies connected through small joints gave a perfect solution.

The first tests showed the following results:

- Removal of the foam from the cavities and producing the connecting joints leaves a three-dimensionally mouldable foamboard.
- The resultant cavities produce a perfect system of venting and filling channels for vacuum injection.
- Curing of the resin creates a honeycomb structure with the walls being supported by the ambient foam.
- The weight of the resin is used to build up a 3-dimensional reinforcing structure much stronger than a single foam core.

Comparing a classic sandwich, i.e. a normal foam core with outer layers, with a 3D|Core sandwich, an epoxy resin system with a core thickness of 10 mm will provide the following increases in the parameters (for example PET):



After checking and confirming these values through additional measurements, ESC started planning a 3D|CORE™ production line in June 2006.

PRODUCT RANGE

ESC develops its products in close cooperation with leading foam producers of the world. We only process polymeric foams which have passed a very strict certification procedure to ensure the best possible result for our customers. 3D|CORE™ is available in the following foam cores:

- E|XPS™ = Foam from XPS (Extruded polystyrene)
- E|PET™ = Foam from PET (Polyethylene terephthalate)
- E|PUR™ = Foam from PUR/PIR (Polyurethane)
- E|PIR™ = Non flammable foam from PIR (Polyisocyanurate) with reduced drapeability

3D|CORE™ PACKING

3D|CORE™ is delivered in modules, which can be assembled to endless structures. In order to achieve a homogeneous structure, the modules feature so-called spacers on two of the four sides. These meet the facing side of the following module without spacers.

The modules are available in following measurements:
540 mm (21,26") by 370 mm (14,57").
Longer modules, depending on the foam type, on request.

The modules of the next generation will have a width of around 600 mm (23,62") and a length up to 2940 mm (115,75").

Standard thicknesses supplied ex stock are 3 mm (0,12"), 5 mm (0,2"), 7 mm (0,28"), 10 mm (0,39"), 12,7 mm (0,5") and 15 mm (0,59").
Other thicknesses between 3 - 15 mm on request.

KITS / ASSEMBLY SETS

To be produced on demand. The basis of your individual kit is an engineering drawing which can be converted to a cutting file. The winding up from your 3D-data will be charged individually.

PACKAGING UNITS

There is no minimum quantity. In order to get the lowest freight rates for you we strongly recommend a mailing carton (800 x 600 x 400 mm) as the smallest unit in the European freight system.

The standard content of a mailing box are the following quantities:
in 3 mm (0,12") = 45 sqm (484.38 sqft)
in 5 mm (0,2") = 30 sqm (322.92 sqft)
in 7 mm (0,28") = 22 sqm (236.81 sqft)
in 10 mm (0,39") = 15 sqm (161.48 sqft)
in 12,7 mm (0,5") = 12 sqm (129.17 sqft)
in 15 mm (0,59") = 10 sqm (107.69 sqft)

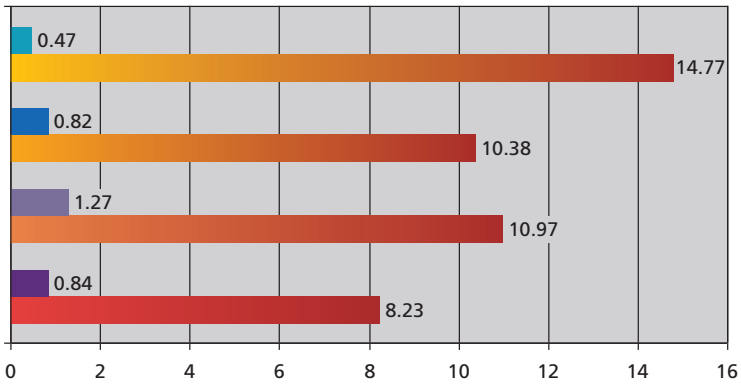
SHEETS

Of course we also provide sheets in several thicknesses. Please contact us.

3D|CORE™

COMPARISION OF TECHNICAL DATA
REGULAR FOAM CORES vs. 3D-CORE™ SAMPLES

Compression strength Mpa



XPS 30 / 0 *
3D|CORE XPS 30 / 0.7 *

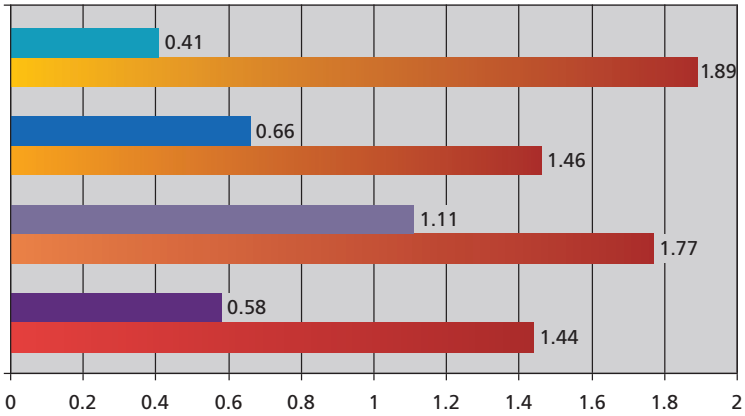
PUR 80 / 0
3D|CORE PUR 80 / 0.6

SAN 94 / 0
3D|CORE SAN 71 / 0.5

PET 115 / 0
3D|CORE PET 115 / 0.2

* 30 = Density / 0.7 = Cavity

Shear stress τ Mpa



XPS 30 / 0 *
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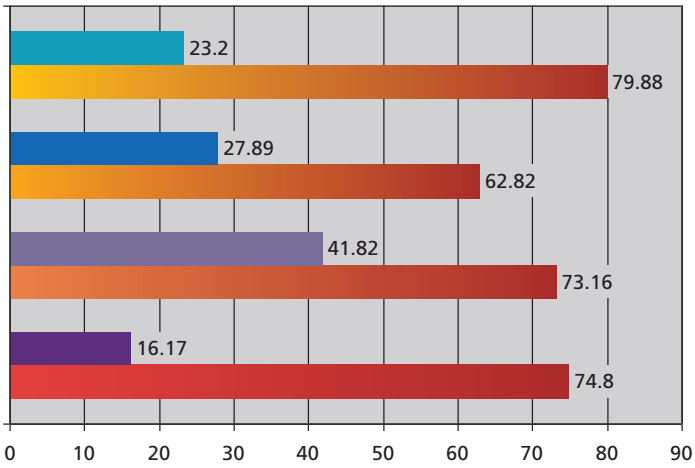
SAN 94 / 0
3D|CORE SAN 71 / 0.5

PET 115 / 0
3D|CORE PET 115 / 0.2

* 30 = Density / 0.7 = Cavity

Flexural strength σ-fM Mpa



XPS 30 / 0 *
3D|CORE XPS 30 / 0.7 *

PUR 80 / 0
3D|CORE PUR 80 / 0.6

SAN 94 / 0
3D|CORE SAN 71 / 0.5

PET 115 / 0
3D|CORE PET 115 / 0.2

* 30 = Density / 0.7 = Cavity

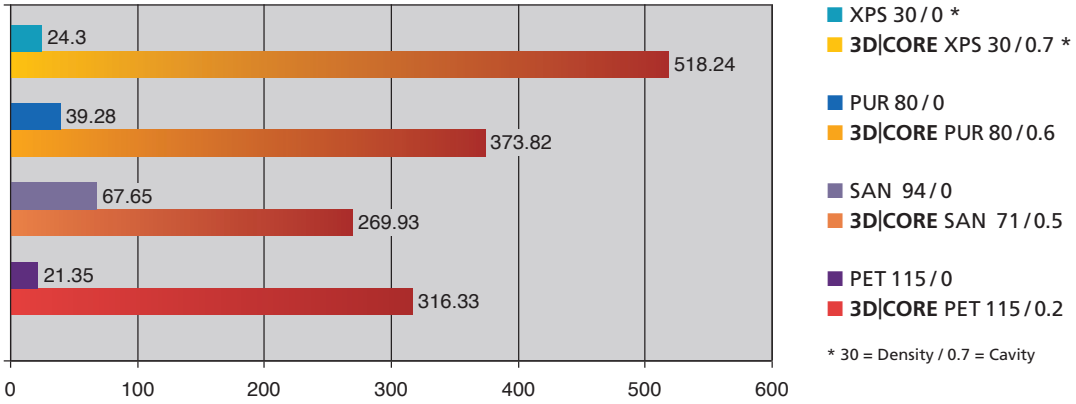
The measurements were carried out by the MPA HANNOVER Material testing laboratory for materials and production technology of the University of Hannover

ESC FOAM IN NEW DIMENSIONS

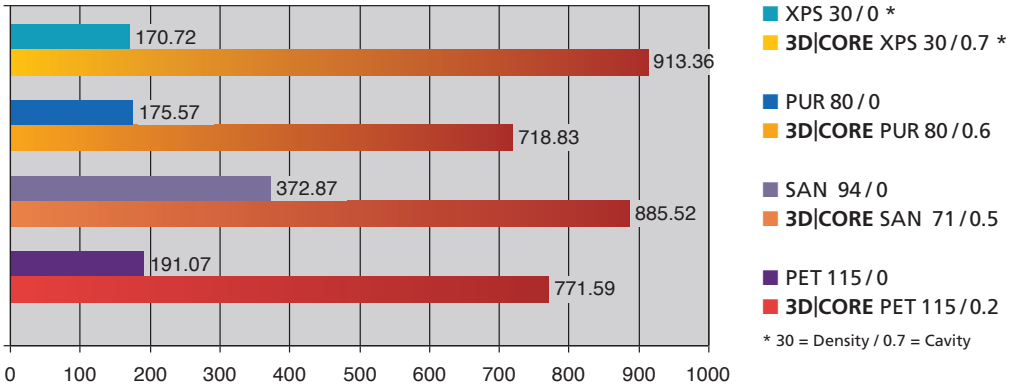
3D|CORE™

COMPARISION OF TECHNICAL DATA
REGULAR FOAM CORES vs. 3D-CORE™ SAMPLES

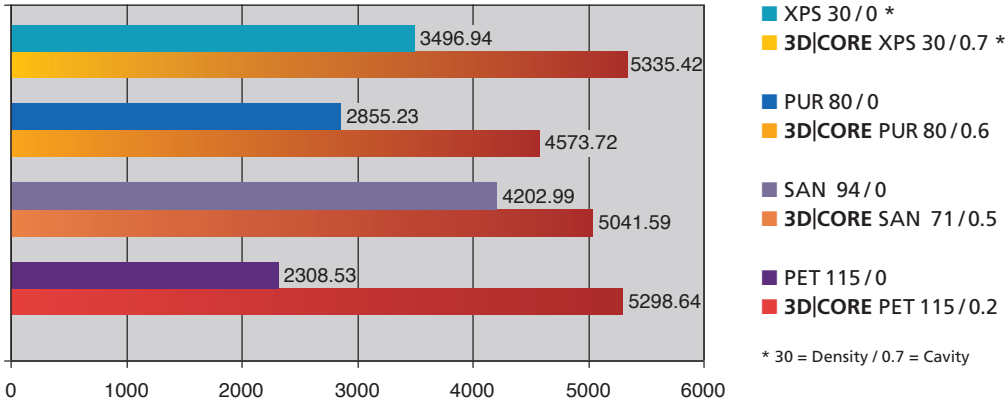
E Modulus MPa (compression strength)



E Modulus MPa (shear strength)



E Modulus MPa (3 point bending test)



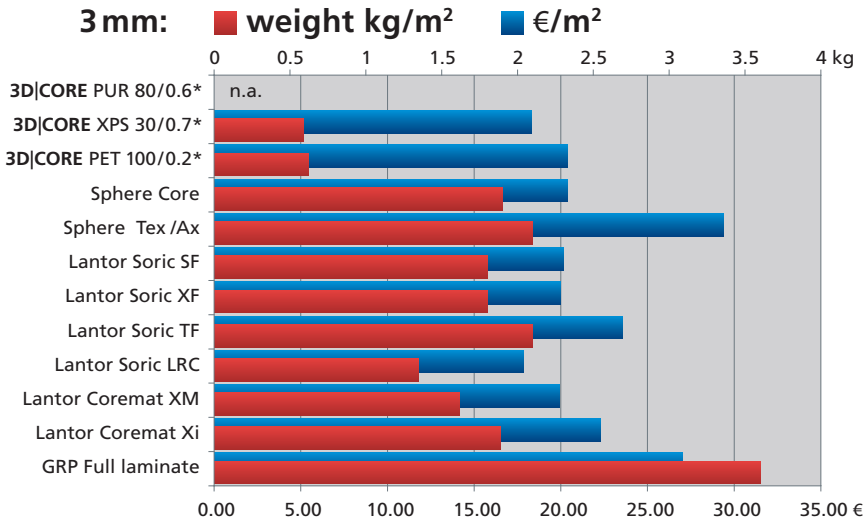
Laminate structure of the specimen

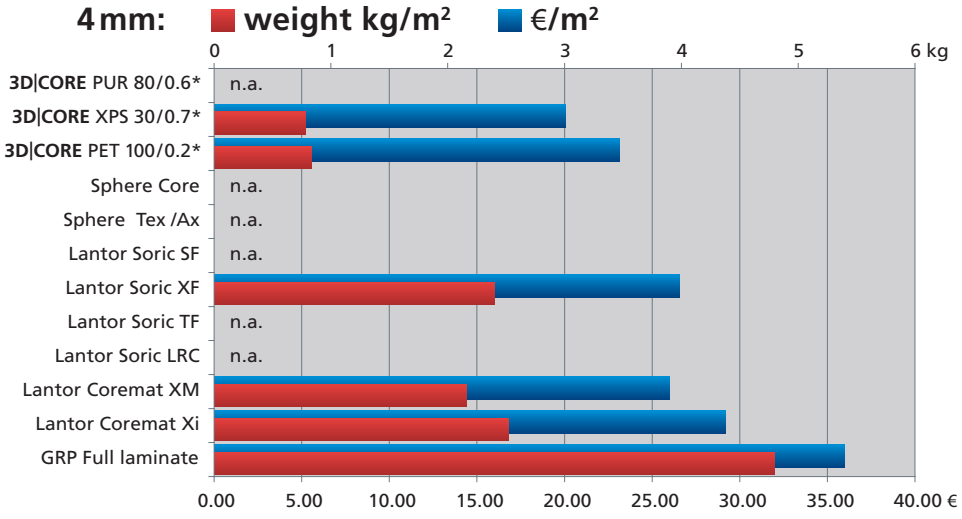
1. Glassfibre Fabric Twill 110 g/m²
2. Glassfibre Quadraxial Fabric 600 g/m²
3. 10 mm foam core
4. Glassfibre Quadraxial Fabric 600 g/m²
5. Glassfibre Fabric Twill 110 g/m²

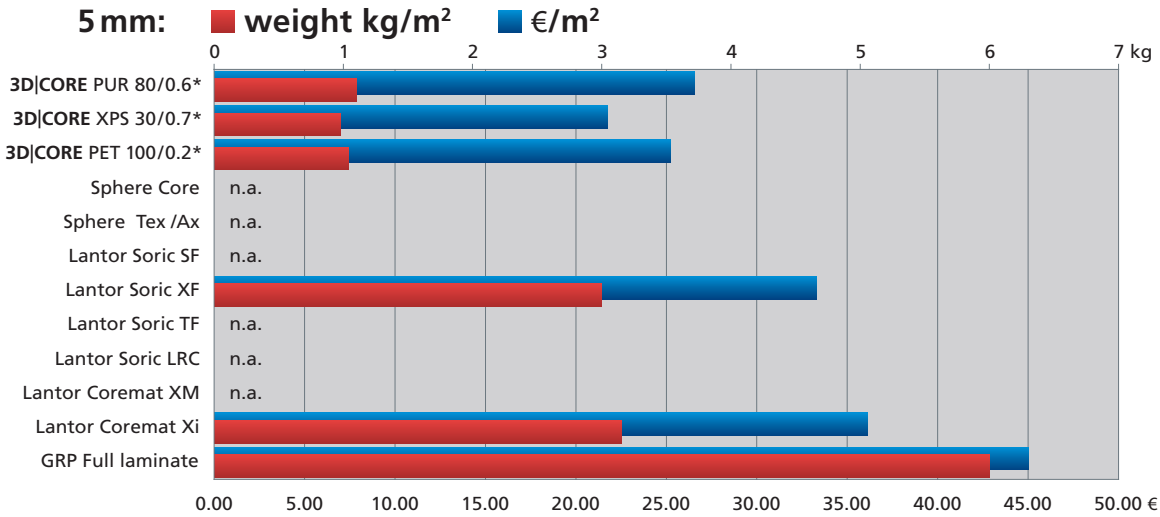
Resin – Epoxy Sicomin 8100/8822
All specimen were produced using the vacuum injection method and cured at 80 °C

3D|CORE™

RELATIONSHIP BETWEEN COST AND WEIGHT OF PROCESSED CORE MATERIALS – 3D|CORE™ VS. COMPETING PRODUCTS



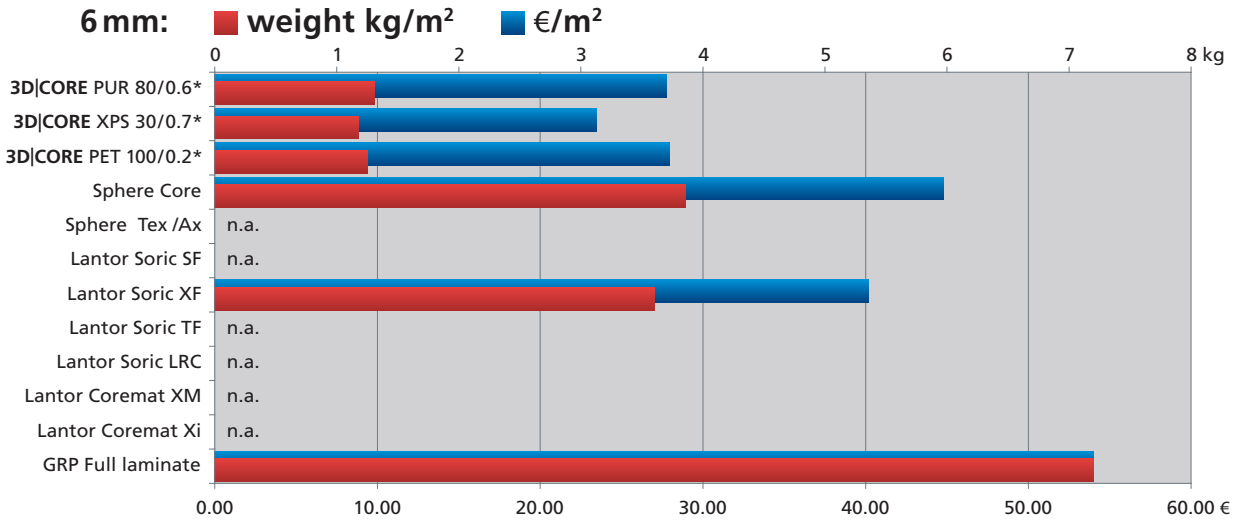


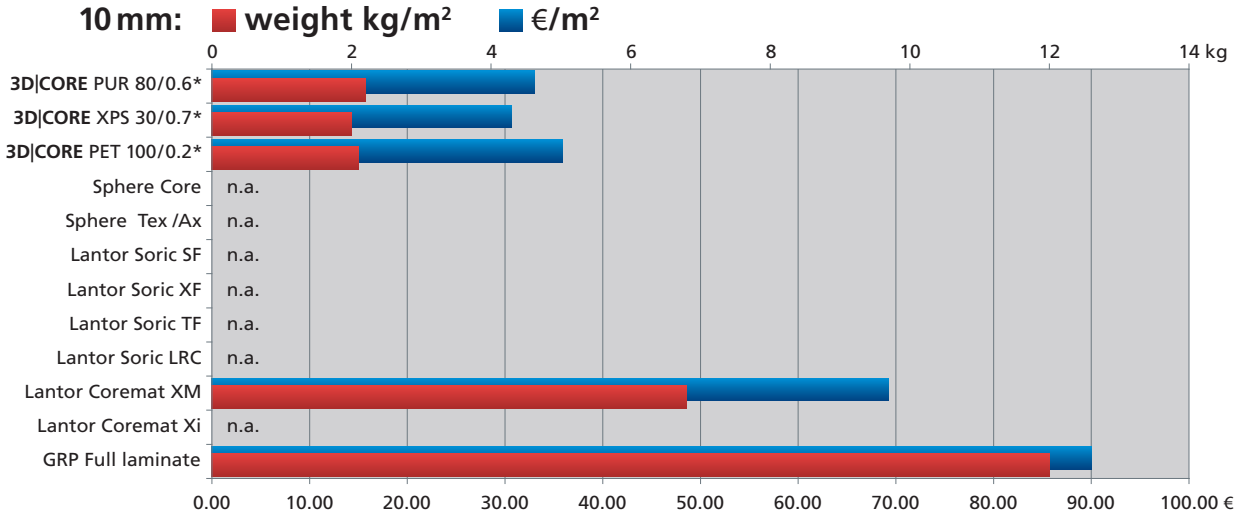


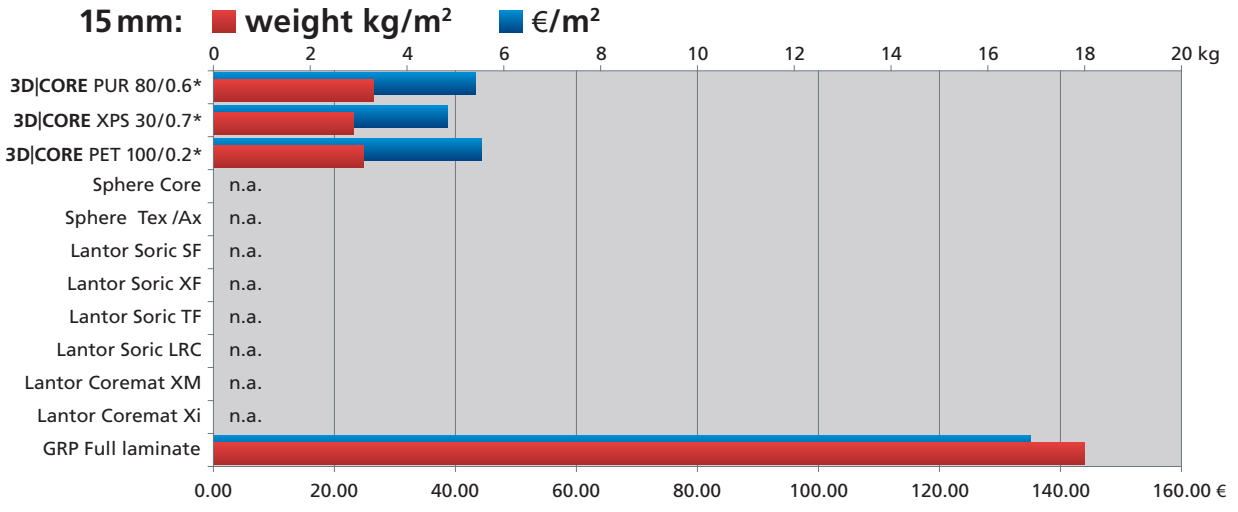
n.a. = Configuration not available * 80 = Density / 0.6 = Cavities
Epoxy resin 8 €/kg. Glass fibre 580 g/m² (size 0,64 mm) 3,22 €/m². Material price based on the regular market price per 100 m².

3D|CORE™

RELATIONSHIP BETWEEN COST AND WEIGHT OF PROCESSED CORE MATERIALS – 3D|CORE™ VS. COMPETING PRODUCTS







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FOAM CORE NAVIGATOR

	XPS 30	PET 80	PET 100	PUR 80
Densities	30 kg/m²	80 kg/m²	115 kg/m²	80 kg/m²
			DNV Cert.	
Compatibility to resin				
Epoxy	good	good	good	good
Polyester	unsuitable	good	good	good
Vinylester	good	good	good	good
Polyurethan	good	good	good	good
Phenolic	good	good	good	good
Temperature				
max. processing temperature	70 °C	170 °C	170 °C	110 °C
Compression strength for autoclave applications				
max. pressure in MPa at 20°C	0,47	0,57	0,82	0,84
Drapeability	good	very good	very good	satisfactory
Application				
Vacuum infusion	very good	very good	very good	very good
RTM	satisfactory	very good	very good	good
Hand lay-up laminate	satisfactory	good	good	satisfactory
Autoclave (Pre preg applications)	unsuitable	good	good	unsuitable
RIM	unsuitable	very good	very good	very good
Available thicknesses	3 mm – 15 mm	3 mm – 15 mm	3 mm – 15 mm	5 mm – 15 mm

3D|CORE™

TIPS FOR APPLICATION AND PROCESSING OF 3D|CORE™

General information

3D|CORE™ is especially suitable for vacuum injection. The matrix facilitates the infusion of the resin into the laminate. The basis of the process always is a well vented resin system with appropriate curing time.

Very good results are also achieved using the hand lay-up technique.
Many foams are also suitable for other methods like RTM, RTM-light, RIM, etc.

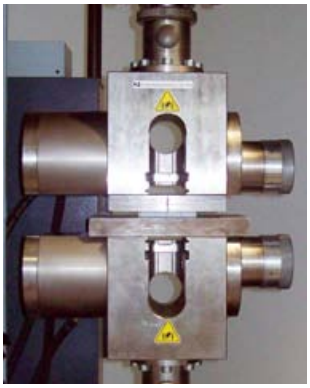
Basis of calculation

In most cases the design of the laminate is calculated with CLT based on standard values. ESC provides a basis of standard values for cores of 10 mm. These standard cores have the following composition (values of other strengths on demand):

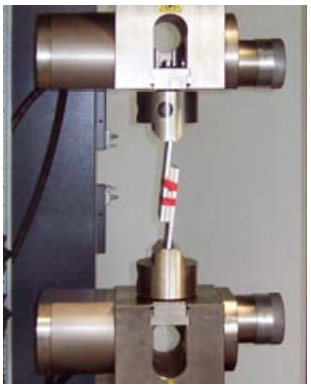
3D|CORE™ covered with two layers of certified 110 g/m² twill glass fabric and 600 g/m² quadraxial glass fabric on top and bottom. This core is filled with a standardized epoxy resin system from the French producer Sicomin.

The designer uses the values as fixed parameters for a virtual "homogenous" material in order to avoid very complex FEM calculations. However we strongly recommend to prepare your own test panels and perform own testings.

For your special resin system, we can determine these values, too. Please request our keenest offer.



3D|CORE in pressure test

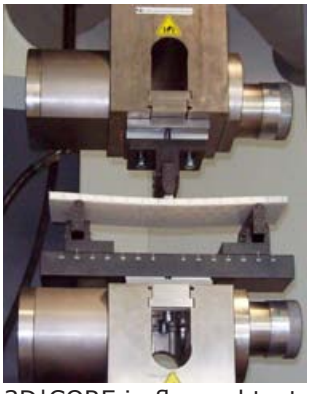


3D|CORE in shear test

Cutting

All described types of foam can be easily cut to the desired shape using good blades and standard tools for wood processing. The modules should be fixed with a steel ruler or similar in order to prevent breaking away of single foam bodies.

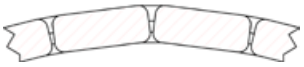
Assembly kits can be produced on demand.



3D|CORE in flexural test

PLACING IN THE MOULD/ FIXATION


1

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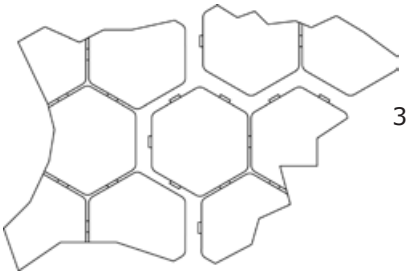
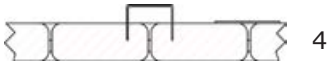

3

Please note the following:

- The joints of the individual hexagonal bodies are not centred so that the modules will easily follow the contour of the mould (drawing 1).
- There are joints as spacers on two outsides of the module. These spacers have to be orientated in the same direction on all modules (drawing 2).
- The following modules have to be inserted so that the connecting joints meet outsides without spacers (drawing 3).
- The modules should be connected together in order to prevent slipping. We have had positive experiences in using medical tape from cellulose acetate with rubber-free adhesive. Good results have also been achieved with polymer staples. (drawing 4).
- The resin should be properly vented before infusion.
- The resin should be injected into the structure and not on the outer layers (drawing 5).
- Attention must be paid to the right consistency of the hand lay-up laminate resin.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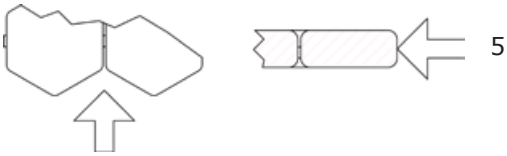
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Vacuum Infusion

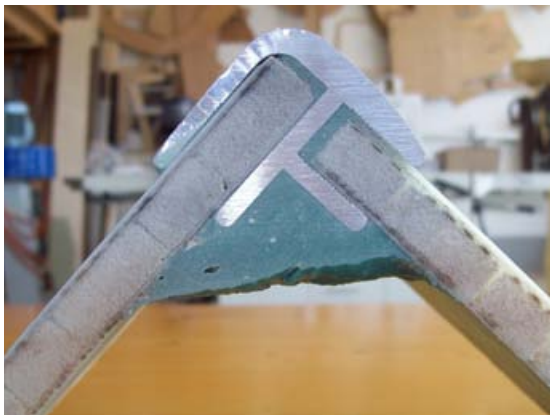
Hand lay-up laminate

3D|CORE™ – APPLICATION EXAMPLE "DYNAMIC"

The "Dynamic" with 3D|CORE™ as core material shows an example of economic efficiency in lightweight construction.

Highlight of the fair: The hull of the "Dynamic"

3D|CORE™ as core material



Hull-deck connection

The deck is produced using the vacuum infusion method

Finished "Dynamic" on the water

ESC 3D|CORE™

CONTACT

For current contact details, please refer to our website
www.escomposite.com

GENERAL INFORMATION

1. Manufacturer and distributors strongly recommend that customers establish their own test panels and conduct tests with the materials supplied to ensure that they are suitable for the intended use.
2. The technical information contain values for the nominal density. These may be undershot or exceeded due to density fluctuations. Minimum values for the design of components are provided on request. Likewise, the dimensions in the range of thickness may vary by +/-0.5 mm in length and by +/-10 mm in length and width per linear metre. Closer tolerances are only available on the basis of a written agreement.
3. The technical details in this publication comply with the manufacturer‘s specifications and the current state of knowledge. For the accuracy of the information and the results arising from their use and from the products described herein, no guarantee can be given.
4. Manufacturer and distributors expressly exclude any warranty. This applies in particular for the suitability of products selected by the customer for his application.
5. Manufacturer and distributors accept no liability for accidents and consequential damage resulting from the use and application of products.
6. No content of this brochure and the website of the manufacturer or the distributor is intended to infringe existing patents or to recommend a patent infringement.

Herford, 01 Juli 2009