



**Vitrulan**  
Composites



REINFORCEMENTS  
FOR TRANSPORT

# REINFORCEMENTS FOR CONTINUOUS LAMINATION

An automated process for forming panels and sheeting in which reinforcement is passed through a resin bath, brought together between plastic sheets and passed through a heating zone for cure. Squeeze rolls control thickness and resin content as the various plies are brought together.

## WOVEN FABRICS

Woven fabrics improves the mechanical properties and the strength of a laminate which is essential when e.g. bolts and screws or metal parts are attached. The woven roving usually forms the middle layer of the skin laminate.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Woven fabrics	300 – 2000	8.8 – 59.0	Increases the mechanical strength of the laminate. Fast impregnation, easy handling.

## SURFACE TISSUE

Surface tissue improves the laminate's appearance, even 20 g/m<sup>2</sup> (0,6 oz/yd<sup>2</sup>) covers print through efficiently and creates a resin rich smooth layer.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Surface tissue	20 – 35	0.6 – 1.0	Good surface aspect even without gelcoat. No pinholes, excellent wet strength, ensures a resin rich surface.



# REINFORCEMENTS FOR INFUSION

Infusion process is an environmentally friendly production technology. It offers an easy way to make laminates with a high glass content and good mechanical properties. Infusion technology offers good reproducibility and is a reliable method to efficiently manufacture parts requiring high dimensional accuracy.

## X-FLOW +45/-45

Good resin flow is essential for successful infusion production. Vitrulan infusion reinforcements are designed to control resin flow during infusion. The unique channel structure incorporated in the reinforcements increases the mold filling speed and ensures complete impregnation of critical areas. One layer of X-flow helps to wet out several layers of standard reinforcement.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
X-flow +45/-45	600 – 2400	17.7 – 70.8	Available with or without mat layer

## INFUSION FABRICS

Infusion fabrics are specifically designed for production of high quality laminates. They offer optimized fiber structures to provide strength in specific directions.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Infusion fabrics	1890 – 2391	55.7 – 70.8	Engineered fabrics made up of fiber layers laid parallel in various directions [0°, 90°, +45°, -45°, +60°, -60°]

## ADHESIVE REINFORCEMENTS

Most reinforcements are available with a polyester / vinyl ester compatible adhesive coating up to 127 cm width. The adhesive keeps the reinforcement in place while the mold is loaded and closed.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Adhesive reinforcement	300 – 2400	8.8 – 70.8	Adhesive possible on: multiaxials, woven combination mat, woven fabrics, combiflow, multiflow

# REINFORCEMENTS FOR THERMOFORMING

## REINFORCED THERMOPLASTIC COMPOSITES

RTC is a non-woven web consisting of chopped glass fiber and polypropylene as matrix. RTC is ideal for interior panels as well as semi-structural parts.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Reinforced Thermoplastic Composite	200 – 2000	5.9 – 59	Also other fibers and matrices are possible

# REINFORCEMENTS FOR DISCONTINUOUS LAMINATION

A process for forming panels and sheeting in which a predetermined number of reinforcement plies are placed over a layer of gelcoat on a laminating table of a specific length and width. Plastic sheets are placed on each side of the laminate.

## WOVEN FABRICS

Woven fabrics improve the mechanical properties and the strength of a laminate which is essential when e.g. bolts and screws or metal parts are attached. The woven roving usually forms the middle layer of the skin laminate.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Woven fabrics	300 – 2000	8.8 – 59.0	Increases the mechanical strength of the laminate. Fast impregnation, easy handling.

## WOVEN COMBINATION MAT

Woven Combination Mat improve work efficiency – one layer equals up to four separate reinforcement layers. Good product for “heavy-duty” panels such as truck floors.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Woven Combination Mat	600 – 2000	17.7 – 59.0	Mat layer(s) stitch-bonded to woven roving. Easy method to increase laminate thickness. Choice of weave style to fit the application.

## STITCHED MAT

Vitruan stitched mat is a very versatile special product with excellent conformability which makes it easier to lay-up even very thick layer of reinforcement in one shot. Stitched mat can be used in hand lay-up, press molding, continuous molding and RTM.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Stitched mat	450 – 1200	13.3 – 35.4	Chopped fibers stitched together with thermoplastic yarn. No chemical binder is used which improves wet out time and the chemical bonding between matrix and reinforcement.

## MULTIAXIALS

Multiaxial reinforcements are specifically designed for production of high quality laminates. They offer optimized fiber structures to provide strength in specific orientations.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Multiaxials	300 – 2400	8.8 – 70.8	Engineered fabrics made up of fiber layers laid parallel in various orientations (0°, 90°, +45°, -45°, +60°, -60°). Also a chopped strand layer can be added.

# VITRULAN FOR LIGHT RTM AND RTM

Closed mold processes are gaining popularity as a manufacturing method in the transport industry. Vitrulan offers special, functional reinforcements providing the excellent drapeability and resin flow properties needed in this process. These modern reinforcements increase efficiency by reducing the time of media placement in this process. These modern reinforcements increase efficiency by reducing the lay-up time and decreasing the cycle time due to their special Flow Media (FM\*).

## COMBIFLOW & COMBIFLOW D

Combiflow – special reinforcements comprising layers of chopped fiber and a porous, elastic flow media stitched together. Combiflow has the ability to conform to difficult shapes without creasing or leaving excessively resin rich areas which are prone to cracking. Combiflow is an elastic, bulky material which fills the mold cavity efficiently and allows variations in the thickness of the mold cavity. Combiflow can be used together with standard reinforcements to improve the flow properties of the reinforcement package.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Combiflow	Mat layers 200 – 1450	Mat layers 5.9 – 42.8	Layer of chopped fiber on both sides of a synthetic flow media for example M300/FM*/M300. Easy drape and fast wet-out.
CombiflowD	Mat layers 200 – 1450	Mat layers 5.9 – 42.8	Layer of chopped fiber stitched onto synthetic flow media to be used together with other standard reinforcements, for example M450/FM*.

## STITCHED MAT

Vitrulan stitched mat is a very versatile special product with excellent conformability which makes it easier to lay-up even very thick layer of reinforcement in one shot. Stitched mat can be used in hand lay-up, press molding, continuous molding and RTM.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Stitched mat	450 – 1200	13.3 – 35.4	Chopped fibers stitched together with thermoplastic yarn. No chemical binder is used which improves wet out time and the chemical bonding between matrix and reinforcement.

## MULTIFLOW

Multiflow products can be tailored by combining a flow media with one or several layers of structural reinforcements, such as multiaxials or woven fabrics, resulting in a Light RTM reinforcements with good mechanical properties.

Product	Weight g/m <sup>2</sup>	Weight oz/yd <sup>2</sup>	Description / properties
Multiflow	700 – 3000	20.6 – 88.5 8.8 – 59.0	One package where flow media is combined to reinforcement fabric or multiaxial. For example: FM*/800 biax/M300

\*Flow Media



The Vitrulan Group includes the three in Germany based companies Vitrulan Textile Glass, V4heat and Vitrulan Technical Textiles as well as Vitrulan Composites in Mikkeli / Finland.

Wall coverings manufactured from glass fabrics, modern infrared surface heating based on glass fabrics and technical textiles and composites made of glass, synthetic and carbon fibers are the core products of the Vitrulan Group.

The new subsidiary of the Vitrulan group, Vitrulan Composites Oy, is a manufacturer of fabrics made of glass, carbon, aramid and polyester fibers for the composite industry. The portfolio of the Mikkeli plant complements the technical textiles range of Vitrulan Technical Textiles GmbH. The application fields comprise transportation, marine, wind energy, anticorrosion as well as construction, insulation and sealing.

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