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The Vitruan Group includes the three in Germany based companies Vitruan Textile Glass, V4heat and Vitruan Technical Textiles as well as Vitruan 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 Vitruan Group.

The new subsidiary of the Vitruan group, Vitruan 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 Vitruan Technical Textiles GmbH. The application fields comprise transportation, marine, wind energy, anticorrosion as well as construction, insulation and sealing.



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REINFORCEMENTS FOR CLOSED MOLD PROCESSES

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Closed mold processes offers an easy way to manufacture laminates with a high glass content and good mechanical properties. Closed mold technology offers good reproducibility and a reliable method to efficiently manufacture parts requiring high dimensional accuracy.

Vitrulan closed mold products are mainly used in demanding marine, wind energy, transportation and building applications. Vitrulan's closed mold reinforcements comprise Combiflow, Combiflow D, Multiflow, Stitched mat, X-flow +45/-45, infusion fabrics, adhesive reinforcements and AceBlade.

COMBIFLOW AND COMBIFLOW D

Combiflow is a special reinforcement which is typically used in the RTM (Resin Transfer Molding) process. Traditional Combiflow is made up of three layers. Layers of chopped fibers on each side of a porous, synthetic Flow Media (FM*) providing excellent resin flow.

Vitrulan Combiflow's binder-free structure gives excellent drapeability, very good resin flow and good compatibility with resins.



*Flow Media

| Product | Weight g/m ² | Weight oz/yd ² | 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. |
| Combiflow D | 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 reinforcements, for example M450/FM*. |

MULTIFLOW

Multiflow is to be used exclusively for closed mold applications. A structural reinforcement, such as a multiaxial or woven fabric, stitched together with the layers of chopped fiber and flow media, provides better mechanical properties than traditional Combiflow.

| Product | Weight g/m ² | Weight oz/yd ² | Description / properties |
|-----------|-------------------------|---------------------------|--|
| Multiflow | 700 – 3000 | 20.6 – 88.5 | One package where flow media is combined to reinforcement fabric. For example Flow media/Biax 800g/M300. |

STITCHED MAT

Vitrulan stitched mat is a very versatile special product with excellent conformability which makes it easier to lay-up even very thick layers of reinforcement in one shot.

Stitched mat can be used in hand lay-up, press molding, continuous molding and RTM.

| Product | Weight g/m ² | Weight oz/yd ² | 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 mechanical results of the laminate. |

X-FLOW +45/-45

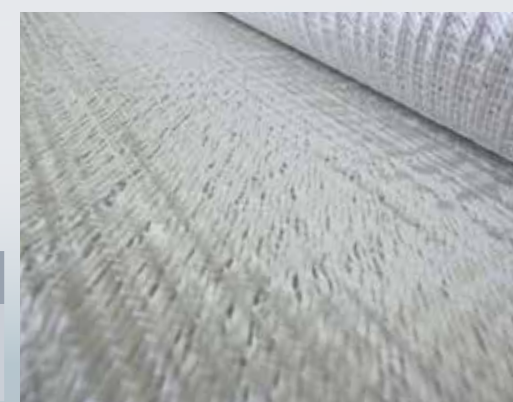
X-flow +45/-45 reinforcements enhance good resin flow, which is essential in successful infusion production. Vitrulan infusion reinforcements are designed to control resin flow during infusion. The unique channel structure of the reinforcements increases mold filling speed and ensures complete impregnation of critical areas. One layer of X-flow helps to wet out several layers of standard reinforcements.



| Product | Weight g/m ² | Weight oz/yd ² | Description / properties |
|----------------|-------------------------|---------------------------|--|
| X Flow +45/-45 | 600 – 2400 | 17.7 – 70.8 | Unique +45/-45 reinforcement for increased mold filling speed. |

INFUSION FABRICS

Vitrulan infusion reinforcements are made up of fiber layers in up to four directions (0, 90, +45, -45, +60, -60) and stitched together or powder bonded together. Stitching configurations can be changed to meet the needs of a specific process. In addition chopped glassfiber layer or tissue can be added.



| Product | Weight g/m ² | Weight oz/yd ² | Description / properties |
|------------------------|-------------------------|---------------------------|--|
| Infusion reinforcement | 300 – 2400 | 8.8 – 70.8 | Optimized fibre structures to provide strength in specific directions. |

ADHESIVE REINFORCEMENTS

Our reinforcements are available with a polyester and vinylester 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 ² | Weight oz/yd ² | Description / properties |
|------------------------|-------------------------|---------------------------|---|
| Adhesive reinforcement | 300 – 2400 | 8.8 – 70.8 | Possible on most of our reinforcements. |

NEW HIGH STRENGTH UNIDIRECTIONAL REINFORCEMENT ACEBLADE

Vitrulan provides a new generation powderbonded UD reinforcement which benefits includes:

- | 20% improvement in tensile strength comparing with stitched UD's
- | Clearly improved tensile and compressive stiffness
- | Superior fiber alignment
- | Homogenous fiber distribution
- | Highly translucent laminates
- | Minimized airvoids



| Product | Weight g/m ² | Weight oz/yd ² | Description / properties |
|------------------------|-------------------------|---------------------------|--|
| AceBlade reinforcement | 300 – 1200 | 8.8 – 35.4 | Next generation powderbonded UD reinforcement. |

