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MAKING A DIFFERENCE AROUND THE WORLD

ArmaPET® Insights
SCREW RETENTION

Mechanical fastening is one possible method of joining dissimilar materials like composite structures to metal frames and other materials. One of the advantages is the relative ease of assembly and disassembly and the common methods are well-understood. A disadvantage could be that the joint is not homogeneous and causing stress concentrations that may impact the structure's integrity.

Screws are a reliable and inexpensive method of mechanical fastening. ArmaPET Struct is engineered to be easy to work with and provides **superior screw retention**. ArmaPET Struct allows direct screwing into the core and obtains immediately full-strength screw connection **without the need for threaded inserts**, reducing assembly cost and time.

ARMAPET STRUCT VS. MEDIUM-DENSITY FIBREBOARD

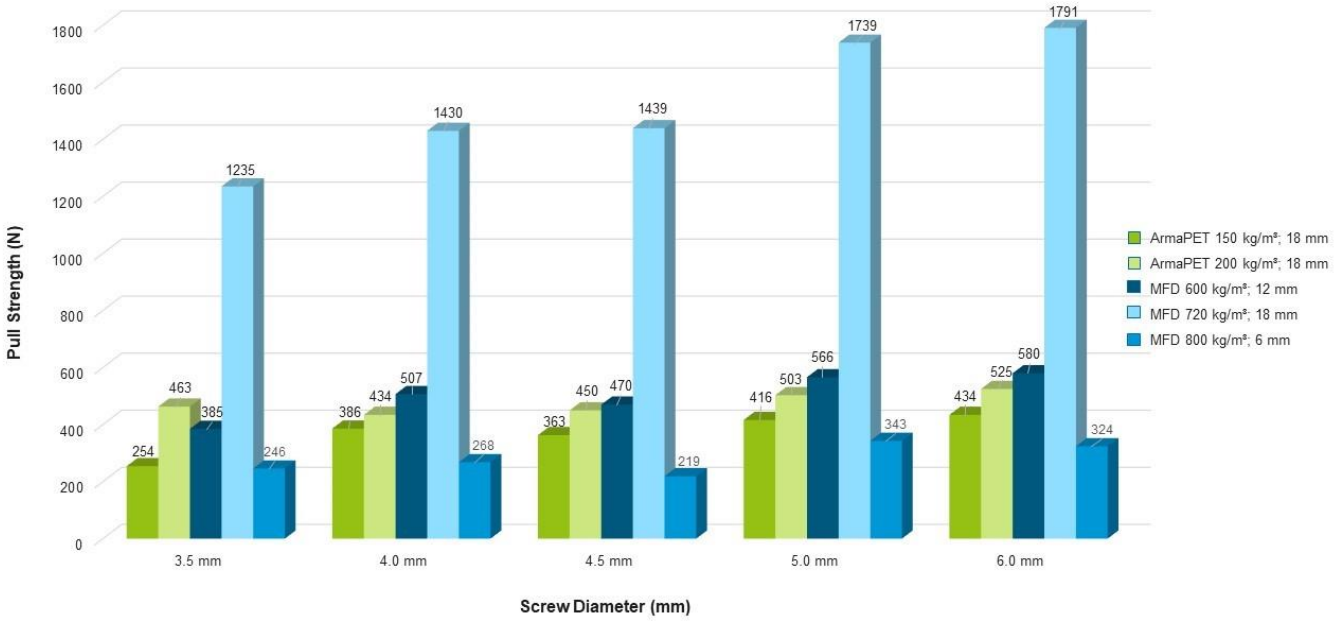
In-house tensile pull-out strength testing screws of PET and MDF sheets in different density, thickness and screw diameter has been carried out.

SETUP

ArmaPET Struct:	150 kg/m³; 18 mm thickness
	200 kg/m³; 18 mm thickness
Medium-density fibreboard:	600 kg/m³; 12 mm thickness; pre-drilling 2.5 mm diameter
	720 kg/m³; 18 mm thickness; pre-drilling 2.5 mm diameter
	800 kg/m³; 6 mm thickness; pre-drilling 2.5 mm diameter

Tensile strength has been tested at a constant speed of 10 mm/min.

For the ArmaPET Struct core material there is a close correlation between the pull-out strength and the density, see graphs. Thus, it is possible to optimise the joint design depending on loading and screw type by choosing the appropriate density of the core material.



SCREW LOCATION AND DENSITY IMPACT

By increasing the density of our ArmaPET Struct and Eco, we improve the mechanical properties, but we also impact the cell size and structure. Additionally, our ArmaPET foam cores have anisotropic properties (different properties along the different axes) and weld lines for our ArmaPET Struct, causing a local rise in density.
But when screwing in a panel, it is difficult to know where exactly we are connecting with the core - is it on a weld line, in between two weld lines, perpendicular to the weld lines?

In order to design your project properly and be as transparent as possible, we tested the following products and densities:

- ArmaPET Struct GR320 (320 kg/m³)
- ArmaPET Struct GR250 (250 kg/m³)
- ArmaPET Struct GR200 (200 kg/m³)
- ArmaPET Struct FR150 (150 kg/m³)
- ArmaPET Eco 195 (195 kg/m³)

We used industry-common hexagon-head coach screws, for structural timber products, screwed at 47±3mm in the foam. The 50x50 foam samples were not pre-drilled, and Φ6 and Φ8 mm screws were tensile pull-out tested.
For each diameter, three positions were tested:

- // in weld = parallel to the weld line plans, on a weld line.
- // in between = parallel to the weld line plans, in between two of them.
- ⊥ weld = perpendicular to the weld line plans.

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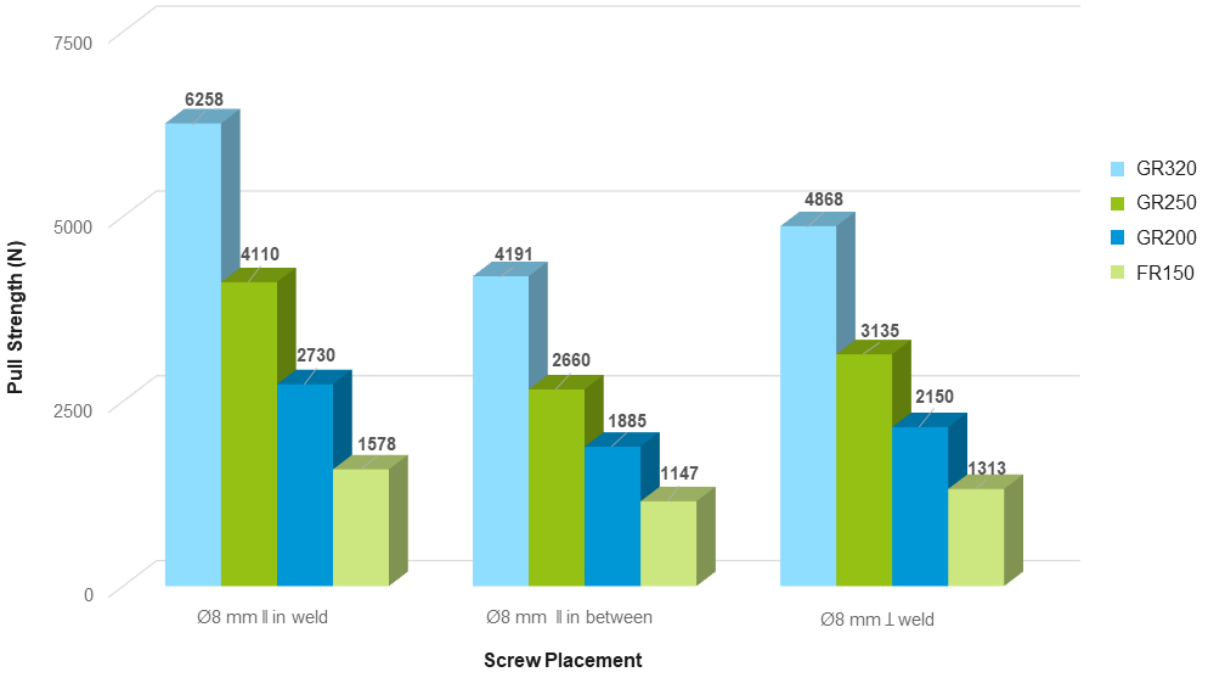
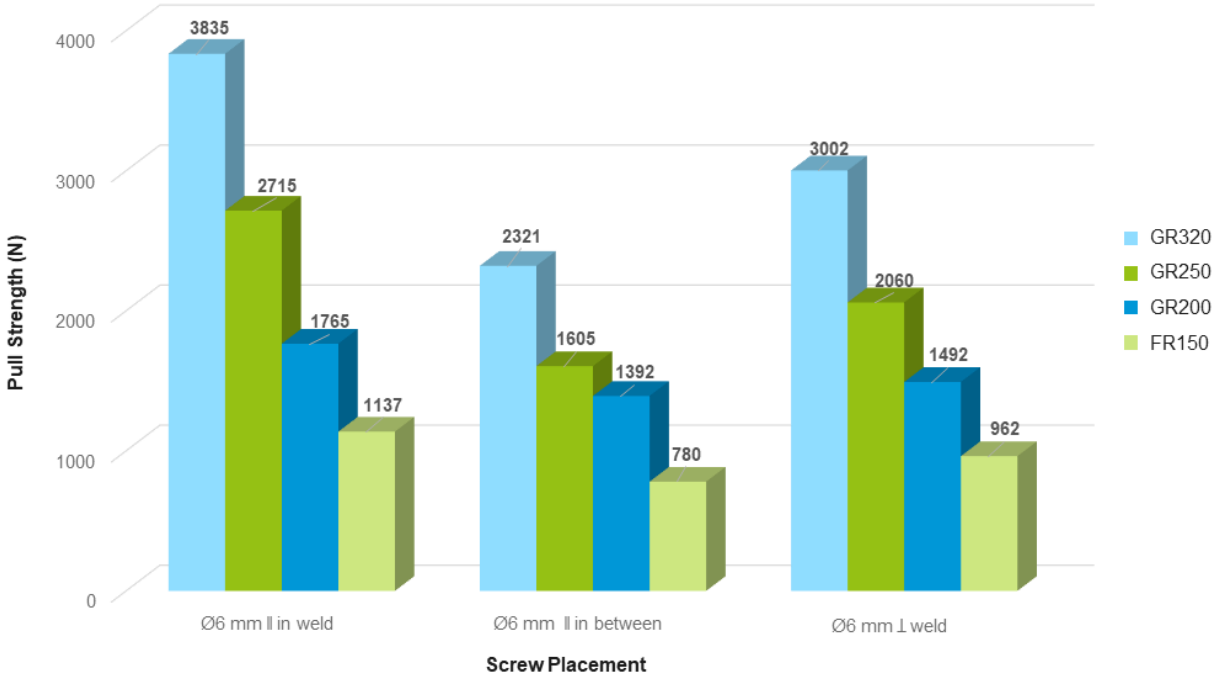
ARMAPET STRUCT

Screws of Φ6 and Φ8 mm





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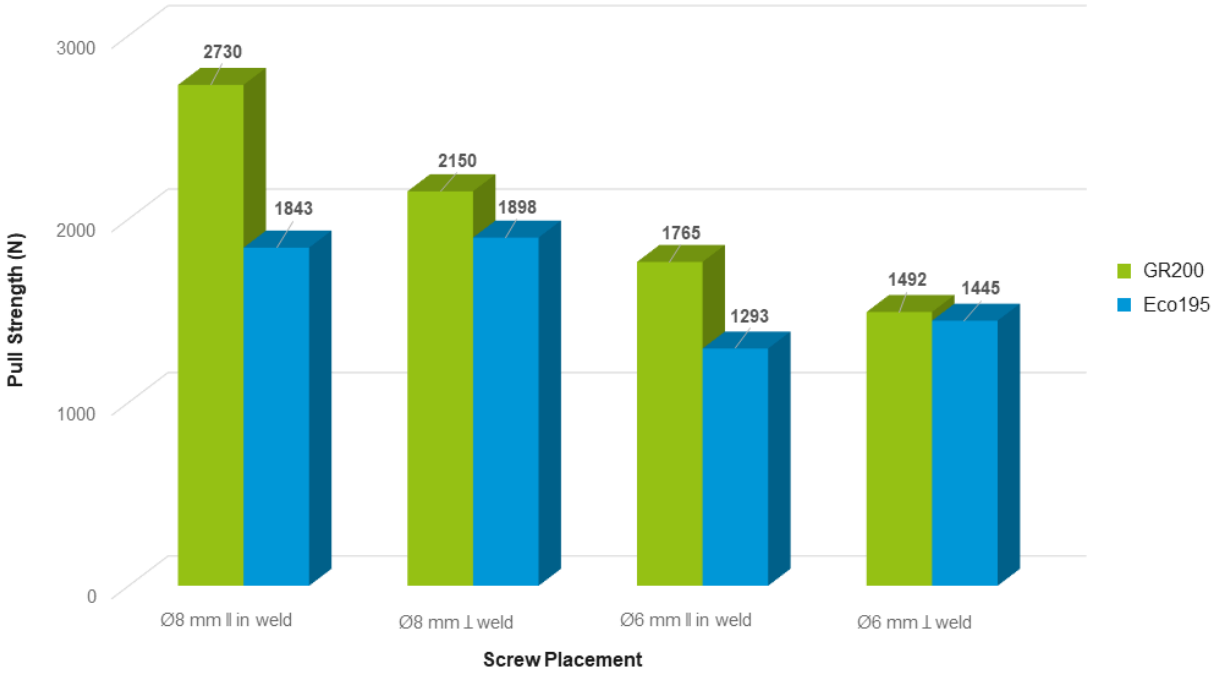
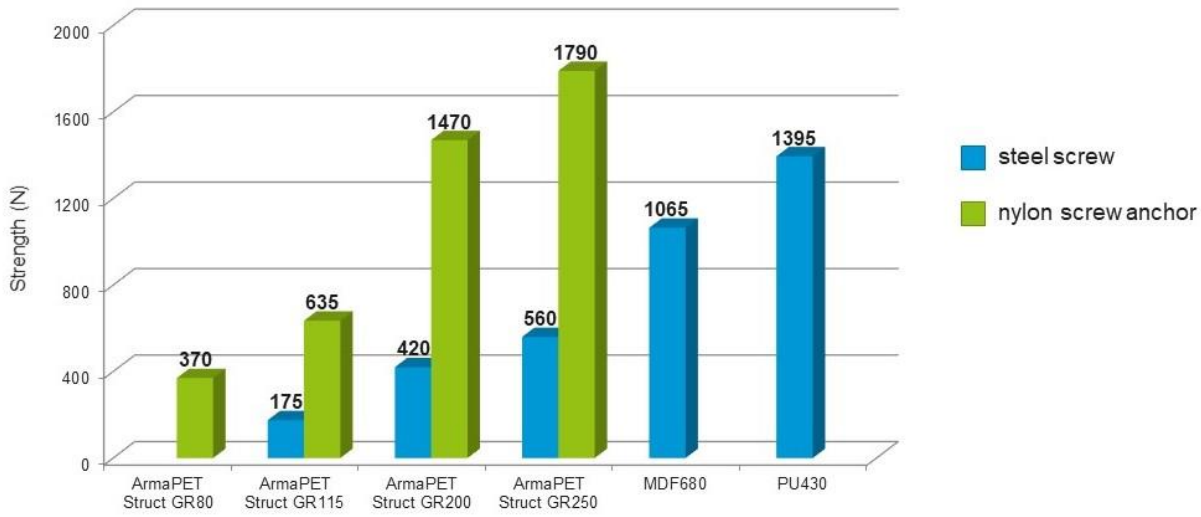
ARMAPET ECO COMPARISON

Screws of Φ6 and Φ8 mm



RESISTANCE TO AXIAL WITHDRAWAL

Testing according to BS EN 320:211



Status: March 2023

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