



QWIK GUIDE: ISO-CF AND ISO-CF/HT POLYISO FOAM CORES AT CRYOGENIC AND LOW TEMPERATURES

This Qwik Guide is a summary of the performance of Dyplast's polyisocyanurate (polyiso or PIR) foam cores at cryogenic temperatures. ISO-CF is our family of foam core substrates for composites that can be manufactured in densities ranging from 2.0 lb/ft³ to 6 lb/ft³ (32-96 kg/m³), suitable for applications temperatures from -297°F to 300°F (-183° to +149°C). ISO-CF/HT is suitable for temperatures up to +350°F (177°C) continuously and +375°F (190°C) intermittent.

ISO-CF and ISO-CF/HT are advanced polyurethanes, ideal for use in composite applications - particularly sandwich composites and composite insulation board! Dyplast has a demonstrated composite substrate material to meet each of the top ten priorities of composite engineers:

- Rigidity/stiffness/strength
- Light-weight
- Thermal and dimensional stability
- Thermal efficiency
- Temperature range diversity
- Fabrication flexibility (size, dimension, shape, tolerance)
- High volume capacity
- Substrate material and adhesive compatibilities
- Excellent water/moisture resistance
- Cost efficiency

ISO-CF and ISO-CF/HT as foam cores can achieve **high bending strength-to-weight ratios and resistance to deformation** (axial/flexural/torsional) when combined with laminate substrates such as carbon, metal, fiber/glass, or poly(carbonate/vinyl/ethylene/etc.).

Cryogenic/Low Temperatures

Materials such as those used in composite applications behave differently at very low temperatures down to cryogenic. Internal chemicals/moisture can freeze, and any inherent gases can liquefy; and many materials transition through a *glass phase* at very low temperatures in which their physical characteristics can change dramatically. The good news is that Dyplast's ISO-CF and ISO-CF/HT technologies have been used in cryogenic pipe applications for decades. Equally impressive, ISO-CF and ISO-CF/HT have had a spectrum of physical properties tested at multiple temperatures down to -265°F (-165°C) in accordance with ASTM C591 and CINI (a European standard). Conversely, most other composite substrates do not go through such rigorous third-party testing at such low temperatures - raising obvious questions about their in-situ performance in, for example, cryogenic applications.

Fortunately, when an engineer/specifier evaluates alternative foam cores for a composite application at very low temperatures, Dyplast can offer physical property data as well as empirical performance information. Thus owners and stakeholders can increasingly mitigate risks that can otherwise occur due to, for instance, using insufficient data or data from insulant test specimens that are not representative of the product delivered.

Summary

ISO-CF and ISO-CF/HT are quite unique since, as closed-cell thermoset rigid foam cores, they offer performance effective from cryogenic temperatures up through 350°F (177°C) - while offering impressive thermal insulation characteristics not available in alternative structural foam cores, with:

- high-volume
- quick-turnaround
- precise dimensional tolerance
- sheets, blocks, or fabricated shapes typically much larger and diverse than alternatives.