

VACUUM INSULATED GLASS (VIG)

ADVANCED THERMAL & STRUCTURAL GLAZING FOR MARINE APPLICATIONS

TECHNICAL BRIEFING

Re-Engineering Marine Glazing Architecture

Conventional marine IGUs require excessive overall thickness and weight to achieve modest thermal resistance, forcing naval architects to compromise on top-side stability, HVAC generator sizing, and total vessel displacement. **Marine VIG** replaces bulky air/gas cavities with a high-vacuum thermal barrier (10^{-4} Torr), delivering architectural-grade U-values in a ultra-thin profile.

KEY ENGINEERING PERFORMANCE DRIVERS

UP TO 60%

TOP-SIDE WEIGHT CUT

vs. Heavy Triple-Pane IGUs

U = 0.60

THERMAL VALUE (\$W/M^2K\$)

R-10 to R-12 Equivalent

0% SWEAT

CONDENSATION RISK

Under 95% Tropical Humidity

TECHNICAL COMPARISON: TRADITIONAL MARINE GLAZING VS. MARINE VIG

GLAZING SPECIFICATION	STANDARD MONOLITHIC / LAMINATED	TRADITIONAL MARINE IGU	MARINE HYBRID VIG LAYUP
Nominal Profile Thickness	12 mm - 19 mm	28 mm - 36 mm	10 mm - 14 mm
Areal Weight (\$kg/m^2\$)	~30 - 45 \$kg/m^2\$	~55 - 75 \$kg/m^2\$	~28 - 35 \$kg/m^2\$
Thermal U\$-Value (\$W/m^2K\$)	5.7 (R-1.0)	2.8 - 3.2 (R-2.0)	0.60 - 0.80 (R-10+)
Interior Dewpoint Barrier	Severe condensation	Moderate fogging at edge	Zero condensation down to -20°C
Acoustic Attenuation (\$R_w\$)	32 dB	35 dB	39 - 42 dB (Engine Noise)

PRIMARY NAVAL ARCHITECTURE BENEFITS

1. SUPERSTRUCTURE WEIGHT & CENTER OF GRAVITY (CG)

Large panoramic salon windows elevated high above the waterline add critical top-side weight. Replacing traditional heavy double-IGUs with VIG lowers the vessel's vertical center of gravity (VCG), reducing roll period and improving sea-keeping stability without sacrificing pane size.

2. CHILLER TONNAGE & GENERATOR SIZING

Solar radiant heat and high outdoor humidity drive extreme HVAC loads on tropical charters. Marine VIG eliminates up to 80% of heat transfer through glazed openings, allowing marine engineers to downsize chiller tonnage, generator fuel burn, and electrical bus capacity.

CROSS-SECTIONAL ARCHITECTURE

The Marine VIG hybrid construction combines high-strength laminated exterior safety glass with a micro-pillar vacuum cavity, engineered specifically to resist dynamic marine wind/wave pressure and frame flexing.

MARINE HYBRID VIG LAYUP CONFIGURATION (SCHEMATIC)



CLASSIFICATION & STRUCTURAL COMPLIANCE ROADMAP

Marine VIG layups are engineered to meet strict international maritime standards and classification society rules for superstructure and hull openings:

- **ISO 11336-1 / Large Yacht Code:** Engineered scantlings and FEA calculations for weather-deck and superstructure installations.
- **ISO 12216 Small Craft Glazing:** Proof testing for drop-impact, water-tightness, and pressure load resistance.
- **Dynamic Hull Shear Mitigation:** Flexible structural silicone perimeter bonding absorbs hull twisting and dynamic deck deflections, protecting the rigid vacuum edge-seal from fatigue.
- **4-Point Flexural Strength (EN 1288-3):** Chemically toughened lites ensure high characteristic bending strength under green-sea pressures.

INTEGRATION & SUPPLY CHAIN COLLABORATION

Partnering with Shipbuilders & Marine Architects

We work directly with naval architects, shipyard engineering teams, and specialized marine glazing fabricators to provide custom 3D CAD modeling, FEA stress analysis, sample prototyping, and joint Classification Society witness testing for target vessel builds.

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