

Keep your profits flowing.



As we dive deeper for oil and gas, extreme environmental conditions make it more challenging than ever to ensure reliable product flow. Crushing pressures and frigid temperatures combine to increase viscosity and deposition, restricting flow and placing enormous demands on flowlines, risers and critical equipment.

Used in syntactic foams for thermal insulation and buoyancy, 3M™ Glass Bubbles help reduce costs in demanding deepwater applications – and help keep both your product and your profits flowing.

- High-strength, low-density hollow glass microspheres
- Virtually insoluble in water
- Low thermal conductivity
- High strength-to-density ratio

3M™ Glass Bubbles for Thermal Insulation

- Able to achieve overall heat transfer coefficient (OHTC) (U values) of $2 \text{ W/m}^2 \text{ K}$ and below, to keep product flowing at greater depths
- Significantly lighter and more flexible, for greater depths and longer tieback distances
- More compact, allowing more insulated pipeline wound per spool for easier, faster, more economical installation

3M™ Glass Bubbles for Buoyancy

For syntactic foams used in buoyancy modules for drill risers, distributed buoyancy modules (DBMs) or buoyancy blocks for undersea vehicles.

- Provides high net buoyancy and maximum lift, enabling production of the highest pressure-resistant syntactic foam
- Can be used to formulate foams to achieve maximum buoyancy in deepest waters

Typical Physical Properties: 3M™ Glass Bubbles for Thermal Insulation (Not for specification purposes.)

Strength	Grade	Minimum Fraction Survival (%)	Crush Strength (psi)	Density (g/cc)	Calculated Thermal Conductivity (W•m ⁻¹ •K ⁻¹)**
HIGH	iM16K	90%	16,000	0.46	0.173
	S42XHS	90%	8000	0.42	0.166
	S32HS	90%	6000	0.32	0.147
	K46	80%	6000	0.46	0.173
	S38XHS	90%	5500	0.38	0.158
	S38HS	80%	5500	0.38	0.158
	S38	80%	4000	0.38	0.158
	XLD3000	90%	3000	0.23	0.130
	S28HS	90%	3000	0.28	0.145
	LOW	S35	80%	3000	0.35

** Calculated Thermal Conductivity of glass syntactic polyurethane (GSPU) foam at 40 volume % loading, assuming a thermal conductivity of 0.19 W•m⁻¹•K⁻¹ for unfilled polyurethane. K values calculated @25°C.

Typical Physical Properties: 3M™ Glass Bubbles for Buoyancy (Not for specification purposes.)

Grade	Density (g/cc)	Minimum Fraction Survival (%)	Crush Strength (psi)	Calculated Density of Syntactic Foam (g/cc)**
K11	0.11	80%	200	0.62
K1	0.125	80%	250	0.64
K15	0.15	80%	300	0.65
S15	0.15	85%	300	0.65
K20	0.20	80%	500	0.67
K20HS	0.20	90%	750	0.67
XLD3000	0.23	90%	3000	0.68
K25	0.25	80%	750	0.70
S28HS	0.28	90%	3000	0.71
S32HS	0.32	90%	6000	0.73

** Assumptions for calculated density: 50% by volume loading of 3M glass bubbles in a resin system with a cured density of 1.14 g/cc, assuming no air entrapment in the final foam and no glass bubble volume losses during processing.

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