

3M™ Glass Bubbles HGS Series for lightweight drilling, completion & workover fluids applications

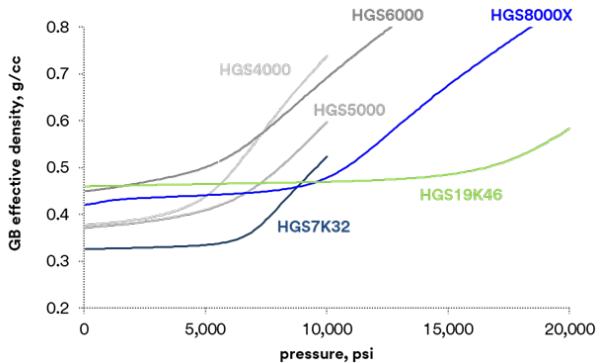
Engineered to perform under pressure



3M Glass Bubbles HGS Series are hollow glass microspheres engineered for greater survivability under demanding downhole conditions.

3M Glass Bubbles HGS Series help achieve and maintain target densities in drilling, completion and workover fluids. These low-density drilling fluids help minimize differential sticking, lost circulation, reduced penetration rates and other problems associated with excessive overbalance conditions. 3M Glass Bubble-based fluids can be reconditioned and reused, helping you reduce costs.

- More homogeneous and incompressible fluid properties compared to aerated systems
- More economical and allow a greater density reduction window than synthetic oils
- Compatible with both water-based and oil-based systems



3M Glass Bubbles (GB) effective densities at pressure

(Not for specification purposes.)

3M™ Glass Bubbles typical physical properties (Not for specification purposes.)

Product	Nominal density (g/cc)	D ₅₀ (Microns)	Isostatic crush strength*	
			Minimum fractional survival	Test pressure (psi)
HGS 7K32	0.32	22	80%	7,000
HGS8000X	0.42	26	90%	8,000
HGS19K46	0.46	20	80%	19,000
HGS 4000	0.38	40	80%	4,000
HGS5000	0.38	40	80%	5,500
HGS6000	0.46	40	80%	6,000

* Tests performed in nitrogen for test pressure up to 6000 psi and in glycerol for test pressure 8000 psi and above

3M Glass Bubbles HGS Series achieve and maintain target density throughout the drilling operation being:

- **Tiny**– 3M Glass Bubbles HGS8000X and HGS19K46 remain in the fluid when circulating through solids control equipment, including shale shakers, hydrocyclones and centrifuges.
- **Tough**– 3M Glass Bubbles HGS8000X and HGS19K46 are resistant to shear and impact forces when circulating through bit nozzles and impacting formation walls.
- **Light**– When synthetic oils are used as base fluid, densities as low as 5.5 lb/gal (0.66 kg/l).

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