3M™ Glass Bubbles
Floated Product Series

Introduction

3M™ Glass Bubbles are engineered hollow glass microspheres that are alternatives to conventional fillers and additives such as silicas, calcium carbonate, talc, clay, etc., for many demanding applications. These low-density particles are used in a wide range of industries to reduce part weight, lower costs and enhance product properties.

The spherical shape of 3M glass bubbles offers a number of important benefits, including: higher filler loading, lower viscosity/improved flow, and reduced shrinkage and warpage. It also helps the 3M glass bubbles blend readily into compounds, and makes them adaptable to a variety of production processes, including spraying, casting and molding. In addition, they offer greater survivability under demanding processing conditions, such as injection molding, and also produce stable voids, which results in low thermal conductivity and a low dielectric constant.

The chemically stable soda-lime-borosilicate glass composition of 3M glass bubbles provides excellent water resistance, to create more stable emulsions. They are also non-combustible and non-porous, so they do not absorb resin. And, their low alkalinity gives 3M glass bubbles compatibility with most resins, stable viscosity and long shelf life.

3M Glass Bubbles Floated Series offer the same combination of strength and light weight as standard 3M glass bubbles, with an added surface treatment of special coupling agents, for use in high-tech applications such as aerospace and hydrospace syntactic foam, radomes and printed wire boards.

They are available in a variety of sizes and grades for various product and processing requirements.

Typical Properties (Not for specification purposes)

Nitrogen Isostatic Crush Strength (3M QCM 14.1.5)

Product	Test Pressure (psi)	Target Fractional Survival	Minimum Fractional Survival
A16/500	500	90%	80%
A20/1000	1,000	90%	80%
H20/1000	1,000	90%	80%
D32/4500	4,500	90%	80%
H50/10,000 EPX*	6,000	90%	90%

*Per ASTM D3102-78 in glycerol.

True Density (3M QCM 14.24.6)

Product	True Density (g/cc)		
	Typical	Minimum	Maximum
A16/500	0.16	0.14	0.18
A20/1000	0.20	0.18	0.22
H20/1000	0.20	0.18	0.22
D32/4500	0.32	0.30	0.34
H50/10,000 EPX	0.50	0.48	0.52

Chemical Resistance

In general, the chemical properties of 3M glass bubbles resemble those of a soda-lime-borosilicate glass.

Surface Treatment

A16/500, A20/1000 and D32/4500 glass bubbles have methacrylato chromic chloride surface treatment, H20/1000 and H50/10,000 EPX glass bubbles have epoxy silane surface treatment.

Packing Factor (Ratio of bulk density to true particle density)

Varies from 55% to 68%.

Oil Absorption

31-36 g oil/100 cc of 3M glass bubbles, per ASTM D1483.

3M

Typical Properties (Continued)

Thermal Properties: Conductivity

0.06-0.16 W/m•K at 68°F (20°C), based on theoretical calculations. Conductivity increases with temperature and product density. The thermal conductivity of a composite will depend on the matrix material and volume loading of 3M glass bubbles.

Thermal Properties: Stability

Appreciable changes in bubble properties may occur above 1112°F (600°C) depending on temperature and duration of exposure.

Flotation (3M QCM 37.2)

Product	Floaters (% by bulk volume) Minimum
A16/500	99%
A20/1000	99%
H20/1000	99%
D32/4500	99%
H50/10,000 EPX	99%

Volatile Content (3M QCM 1.5.7)

Maximum of 0.5 percent by weight.

Alkalinity (3M QCM 55.19)

Maximum of 0.3 milliequivalents per gram

pH

Because 3M™ Glass Bubbles are a dry powder, pH is not defined. The pH effect will be determined by the alkalinity as indicated above. When 3M glass bubbles are mixed with deionized water at 5 volume percent loading, the resulting pH of the slurry is typically 9.1 to 9.9, as measured by a pH meter.

Dielectric Constant

1.3 to 1.5 @ 100 MHz, based on theoretical calculations. The dielectric constant of a composite will depend on the matrix material and volume loading of 3M glass bubbles.

Size

Product	Particle Size (microns, by volume) (3M QCM 193.2) Distribution			Effective Top Size
	10th%	50th%	90th%	95th%
A16/500	30	60	95	115
A20/1000	25	60	90	105
H20/1000	25	60	90	105
D32/4500	20	40	65	80
H50/10,000 EPX	15	30	55	70

Hard Particles (3M QCM 93.4.3)

No hard particles (e.g., glass slag, flow agent, etc.) greater than U.S. number 40 (420 microns) standard sieve will exist.

Sieve Analysis (3M QCM 93.4.4)

For *A16/500, A20/1000, H20/1000* glass bubbles: Using a 10 gram sample on a U.S. number 80 standard sieve (177 microns), a maximum of five percent by weight glass bubbles will be retained on the sieve.

For *D32/4500, H50/10,000 EPX* glass bubbles: Using a 10 gram sample on a U.S. number 200 sieve (74 microns), a maximum of three percent by weight glass bubbles will be retained on the sieve.

Appearance (3M QCM 22.85)

White to the unaided eye. *A16/500, A20/1000, and D3L/4500* have a green tint from the surface treatment.

Flowability (3M QCM 22.83)

3M glass bubbles remain free flowing for at least one year from the date of manufacture if stored in the original, unopened container in the minimum storage conditions of an unheated warehouse.

Labeling

3M glass bubbles will be packaged in suitable containers to help prevent damage during normal handling and shipping. Each container will be labeled with:

1. Name of manufacturer
2. Type of 3M glass bubbles
3. Lot number
4. Quantity in pounds

Storage and Handling

To help ensure ease of storage and handling while maintaining free flowing properties, 3M™ Glass Bubbles have been made from a chemically stable glass and are packaged in a heavy duty polyethylene bag within a cardboard container.

Minimum storage conditions should be unopened cartons in an unheated warehouse.

Under high humidity conditions with the ambient temperature cycling over a wide range, moisture can be drawn into the bag as the temperature drops and the air contracts. The result may be moisture condensation within the bag. Extended exposure to these conditions may result in "caking" of the 3M glass bubbles to various degrees. To minimize the potential for "caking" and prolong the storage life, the following suggestions are made:

1. Carefully re-tie open bags after use.
2. If the polyethylene bag is punctured during shipping or handling, use this bag as soon as possible, patch the hole, or insert the contents into an undamaged bag.
3. During hot and humid months, store in the driest, coolest space available.
4. If controlled storage conditions are unavailable, carry a minimum inventory, and process on a first in/first out basis.

Dusting that may occur while handling and processing can be minimized by the following procedures:

1. For eye protection wear chemical safety goggles. For respiratory system protection wear an appropriate NIOSH/MSHA-approved respirator. (For additional information about personal protective equipment, refer to Material Safety Data Sheet.)
2. Use appropriate ventilation in the work area.
3. Pneumatic conveyor systems have been used successfully to transport 3M glass bubbles without dusting from shipping containers to batch mixing equipment. Static eliminators should be used to help prevent static charges.

   Diaphragm pumps have been used to successfully convey 3M glass bubbles. Vendors should be consulted for specific recommendations.

3M glass bubble breakage may occur if the product is improperly processed. To minimize breakage, avoid high shear processes such as high-speed Cowles™ Dissolvers, point contact shear such as gear pumps or 3-roll mills, and processing pressures above the strength test pressure for each product.

Health and Safety Information

For product Health and Safety Information, refer to product label and Material Safety Data Sheet (MSDS) before using product.

Packaging Information

Mini-Box

A single corrugated box with a plastic liner.
Box dimensions are 16 in. × 16 in. × 20 in.

Small Box (10 Cubic ft.)

A single corrugated box with a plastic liner. All boxes are banded together and to the wooden pallet. 4 boxes per pallet.

Box dimensions are 22 in. × 19 in. × 39 in.
Pallet size is 42 in. × 48 in.

Box Weights

Product	Mini-Box	Small Box
A16/500	10 lb.	50 lb.
A20/1000	10 lb.	50 lb.
H20/1000	10 lb.	50 lb.
D32/4500	10 lb.	100 lb.
H50/10,000 EPX	10 lb.	100 lb.

Additional Information

3M™ Glass Bubbles are supported by global sales, technical and customer service resources, with fully-staffed technical service laboratories in the U.S., Europe, Japan, Latin America and Southeast Asia. Users benefit from 3M's broad technology base and continuing attention to product development, performance, safety and environmental issues.

For additional technical information on 3M glass bubbles in the United States, call 3M Energy and Advanced Materials Division, **800-367-8905.**

For other 3M global offices, and information on additional 3M products, visit our web site at: **www.3M.com/oilandgas.**

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The Cary Company

3M™ Glass Bubbles K25

K25 glass bubbles have a density of 0.25 g/cc and an isostatic crush strength of 750 psi. The general purpose K Series glass bubbles are the most economical 3M glass bubbles.

PRODUCT SEARCH...

Product Information

Density Reducing Agents for Buoyancy
Low density (0.25 g/cc) and high isostatic strength make 3M Glass Bubbles K25 ideal additives for shallow water buoyancy applications or processing applications where high strength is needed. In addition, like all 3M glass bubbles, K25 bubbles are compatible with polyurethane, polypropylene and epoxy, and are virtually insoluble in water.

Industrial Explosives
In demanding explosions, 3M K25 bubbles are an ideal sensitizer. Their low density and high strength allows their use in high performance explosives like packaged emulsions, water gels and slurries.
- Provide outstanding velocity of detonation (VOD); high fragmentation
- Inert, non-coalescing particles provide consistent performance over time
- True density: 0.25 g/cc
- Target crush strength (90% survival): 750 psi

Paints and Coatings
3M glass bubbles offer a variety of benefits to light weight, high-build elastomeric roof coatings, anti-condensation coatings, etc. Here are some of the benefits:
- Lower viscosity, improved flow
- Increased filler loading, reduced cost
- VOC reduction
- Chemical stability and inertness
- Reduced dielectric constant
- Thermal conductivity reduction
- Temperature resistance

Downloadable Information:

MSDS-Material Safety Data Sheet

PRODUCT DATA SHEET

SELECTION GUIDE

Order

RETURN TO 3M PRODUCTS

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