3M™ Microspheres
Selection Guide

Customer-Proven Performance

3M

Selecting microspheres for performance enhancements

3M™ Microspheres offer a variety of inherent advantages over typical irregularly shaped mineral fillers. And 3M can offer engineered microspheres with different sizes, strengths, densities and compositions. Combining the inherent advantages with engineered features provides a wide choice of unique potential enhancements to help you meet specific processing and end-use requirements for many applications.

More than one type of microsphere may be appropriate for an application depending on requirements for texture, processing equipment and cost. Smaller spheres can help provide a smoother feel. And some equipment can damage lower strength spheres. The following charts present 3M microspheres commonly considered for many typical applications.

Application Ideas	Potential Enhancements*	Product	Considerations
Auto Body Repair Filler	Reduced pinholes, lightweight sanded surface	K1, K15, S15, S22	
Adhesives (Aerospace)	Weight reduction, reduced shrinkage, high filler loading/reduced VOCs	K25	Low cost
		S32, K37	When processing requires higher strength
		A16/500, A20/1000, D32/4500	For high performance (ROV)
Bowling Ball Cores	Density control	K1	Low cost
		K15, K20, S32, XLD 3000	When processing requires higher strength
Buoyancy (Oil and Gas)	Cost reduction, weight reduction, water resistance, sandability/machinability	A16/500, A20/1000, H20/1000, D32/4500	For high performance
		K1, K15	Shallow water flotation
		K20, K25, S32	Deep water flotation
		XLD3000	When low density is required
Cast Urethane	Cost reduction, sandability/machinability, reduced warpage/shrinkage, weight reduction	K1, K15	Low cost, low strength
		K20	Commonly used
Cryogenic Insulation (Bulk)	Increased insulation, decreased compaction, annulus filler	K1	
Caulks	Reduced shrinkage	K1	Low cost
		K15, K20	When processing requires higher strength
		S15	Small particle size for smooth texture
Cultured Marble	Sandability/machinability, weight reduction, thermal shock resistance	S22	Small particle size for smooth texture
		K1	Low cost
		K15, K20	When processing requires higher strength
Furniture (Cast Polyester)	Cost reduction, sandability/machinability, reduced warpage/shrinkage, weight reduction	K1	Low cost
		K15, K20	When processing requires higher strength
Injection Molded/ Extruded Composites	Weight reduction, productivity improvements, resin displacement, improved dimensional stability	S38	Low cost
		K37, K42HS, K46, S60, S60HS, S38HS, S38XHS	When processing requires higher strength
		iM30K, iM16K	When extrusion/molding requires very high strength
Marine putties	Cost reduction, weight reduction, reduced shrinkage/warpage	K1	Low cost
		K15, K20	When processing requires higher strength
Deep Sea Wet Pipe Insulation (Oil and Gas)	High strength, low thermal conductivity	S38HS	High strength
		S38XHS	Extra high strength
		XLD3000	Extra low density

* Actual enhancements realized may vary depending on a variety of factors, some of which are uniquely within the user's knowledge and control. As a result, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.

Application Ideas	Potential Enhancements*	Product	Considerations
Paints (Architectural)	Improved scrubbability, burnish and stain resistance	W-210, W-410, W-610	White for easy color matching
Paints (Industrial & Maintenance)	Gloss control, burnish resistance, hardness, corrosion resistance, abrasion resistance, higher solids/reduced VOCs	W-210	Smallest particle size, least gloss reduction
		W-410	6 Hegman grind
		W-610	Maintenance paints
Plastic Components	Weight reduction, reduced shrinkage, improved throughput	K37, K42HS, K46, S38, S38HS, S38XHS, S60, S60HS, iM30K, iM16K	When optimized formulation is critical
Plywood Patch	Cost reduction, sandability, reduced shrinkage	K15, K20	Yields low density
Potting Compounds (Lightweight)	Weight reduction, reduced shrinkage, reduced dielectric constant, thermal insulation	A16/500, A20/1000, H20/1000	For high performance
		K1	Low cost
		K15, K20	When processing requires higher strength
Potting Compounds (Regular Weight)	Reduced shrinkage, thermal stress crack resistance	W-610	Small particle size
Powder Coatings	Abrasion resistance, improved flow	W-210	Small particle size
		W-410	6 Hegman grind
Rubber Components	Weight reduction, improved throughput	K42HS, S60, S60HS, iM30K, iM16K	When high strength, low density is required
SMC	Class A surface finish	S38, S60, S60HS, iM30K, iM16K	Small particle size for improved surface finish
Spackling Compounds	Sandability, reduced shrinkage	K1	Low cost, commonly used
		K15, K20	When processing requires higher strength
		S15, S22	Small particle size for smooth texture
Spray-Up/Lay-Up	Cost reduction, sandability/machinability, reduced warpage/shrinkage, weight reduction	K1	Low cost, not recommended for spray applications
		K15	When processing requires higher strength, not recommended for spray applications
		K20	When processing requires higher strength, commonly used, not recommended for spray applications
		K25, S32, S35	Higher strength for spray applications
Syntactic Foam (Oil and Gas)	Cost reduction, weight reduction	S32, S35	Low cost
		A16, A20, H50, K37, S38, S38HS, S38XHS	For survivability at deep sea pressures
		XLD6000	When low density is required
Tape Joint Compounds	Reduced shrinkage, sandability	K1	Low cost
Tile Grout	Reduced shrinkage, improved flow	K20	Low cost
		K25	When processing requires higher strength
Tooling Board	Less dust during machining, sandability, machinability	K1, K15, S15, S22	Small particle size
Void Filler (Aerospace)	Lightweight	A16, A20, D32	Lightweight

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3M™ Glass Bubbles Floated Series

	Target Crush Strength (90% survival, psi)	True Density (g/cc)	Typical Particle Size (microns, by volume) Distribution 10th%	50th%	90th%	Color (unaided eye)
A16/500	500	0.16	25	55	90	green
G18	500	0.18	15	35	70	white
A20/1000	1000	0.20	25	50	85	green
H20/1000	1000	0.20	25	50	85	white
D32/4500	4500	0.32	15	35	60	green
H50/10,000 EPX	10,000*	0.50	15	35	60	white

*H50 strength per 3M QCM 90% survival minimum.

Note: Technical information and data shown here should be considered representative or typical only and should not be used for specification purposes.

Refer to product data pages for additional technical information.

3M™ Glass Bubbles Series

	Target Crush Strength (90% survival, psi)	True Density (g/cc)	Typical Particle Size (microns, by volume) Distribution 10th%	50th%	90th%	Color (unaided eye)
K1	250	0.125	30	65	115	white
K15	300	0.15	30	60	105	white
S15	300	0.15	25	55	90	white
S22	400	0.22	20	35	65	white
K20	500	0.20	25	55	95	white
K25	750	0.25	25	55	90	white
S32	2000	0.32	20	40	70	white
S35	3000	0.35	10	40	75	white
K37	3000	0.37	20	45	80	white
XLD3000	3000	0.23	15	30	40	white
S38	4000	0.38	15	40	75	white
S38HS	5500	0.38	15	40	75	white
S38XHS	5500	0.38	15	40	70	white
K46	6000	0.46	15	40	70	white
K42HS	7,500	0.42	11	22	37	white
S60	10,000	0.60	15	30	55	white
S60HS	18,000	0.60	11	30	50	white
iM16K	16,000	0.46	12	20	30	white
iM30K	28,000	0.60	9	16	25	white

3M™ Ceramic Microspheres

	Target Crush Strength (90% survival, psi)	True Density (g/cc)	Typical Particle Size (microns, by volume) Distribution 10th%	50th%	90th%	Color (unaided eye)
W-210	>60,000	2.4	N/A	N/A	13	white
W-410	>60,000	2.4	N/A	N/A	23	white
W-610	>60,000	2.4	N/A	N/A	38	white

Beyond microsphere enhancements... technical support and worldwide service

It can take more than quality products to help you solve complex problems. That's why 3M also provides technical support, a proven global service network, and ongoing R&D to help you meet your ever-evolving needs.

R&D... expanding our capabilities to serve you

With a focus on continuous improvement and innovation, 3M R&D takes you beyond our current microsphere technology – microencapsulation, surface treated products and metal coated products.

Resources

3M™ Microspheres are supported by global sales, technical and customer service resources, with fully-staffed technical service laboratories and an authorized distributor network 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 – including development of innovative solutions such as surface-treated and metal-coated products.

For additional technical information on 3M microspheres in the United States, call 3M Advanced Materials Division, **800-367-8905.** For other 3M global offices, and information on additional 3M products, visit our website at: **www.3M.com/microspheres**.

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