

Microspheres & Particles

Korean Distributor - 주식회사 셀코 (Cellkor Inc)

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General Catalog

Polymer Microspheres

Silica Microspheres

QuantumPlex™ Multiplexing Platforms

Magnetic Microspheres & Particles

Accessory Reagents & Companion Products

Magnetic Bioseparations

Cell Separations

Protein Removal

Glycan / Glycoprotein Capture

Nucleic Acid Isolation

Instrument Standards

NIST Traceable Size

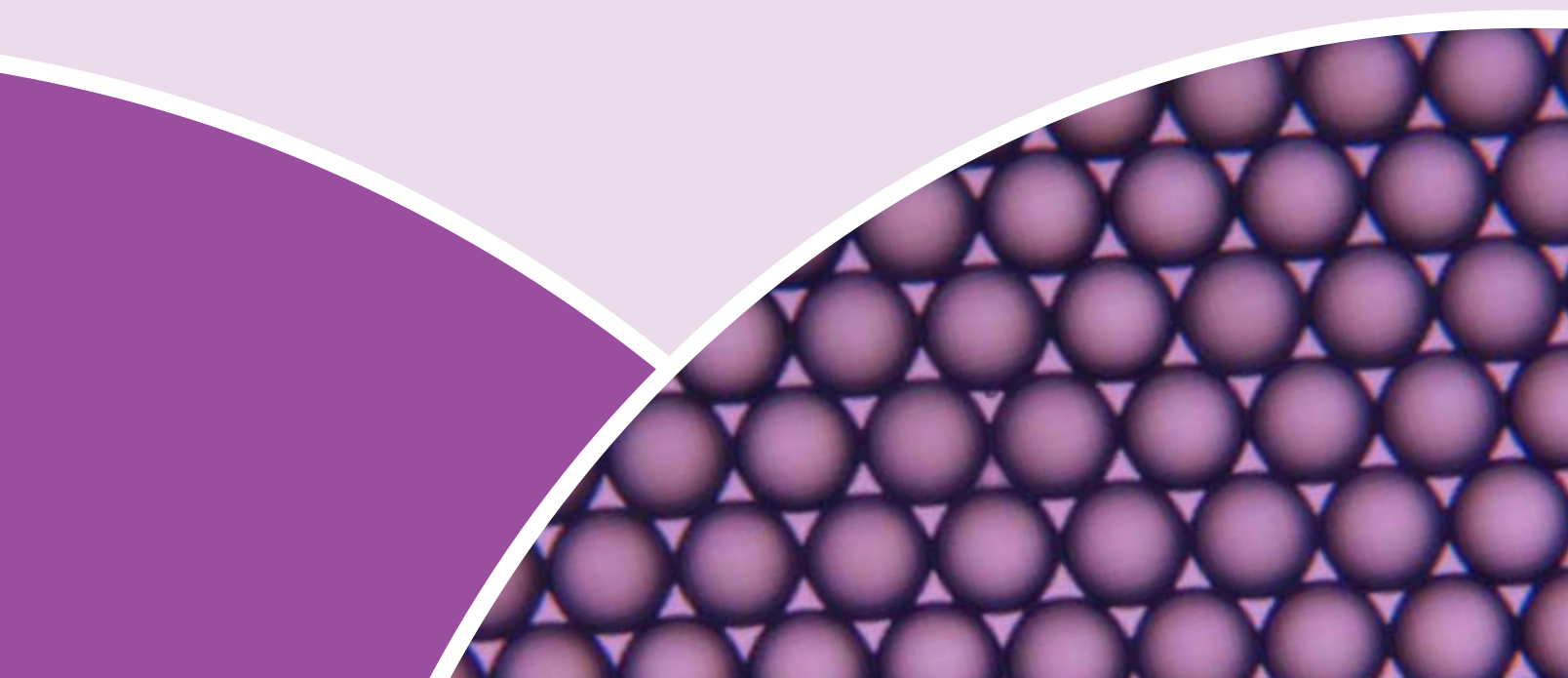
Count

Fluorescence

Cell Viability

Flow Cytometry

Technical Information



New Products

ProMag™ HC

ProMag™ HC (High Capacity) 1 µm is our latest advancement in magnetic particles. Intended for high capacity isolations, design parameters include high surface area and functionality.

ProMag™ 1 HC COOH402

ProMag™ HC 1 Series Streptavidin402

Vivaspin® Ultrafiltration Device.411

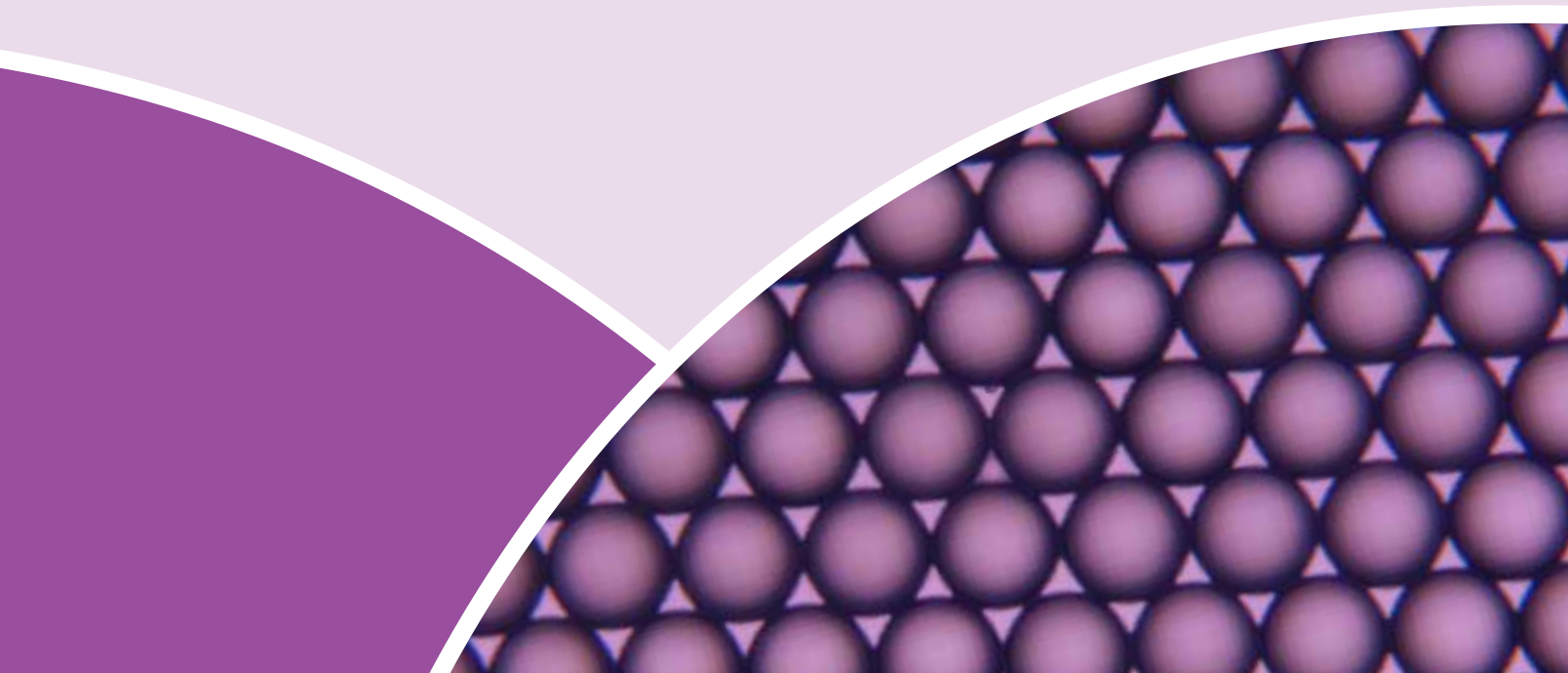
Vivaspin® Concentrators are disposable ultrafiltration devices that may be utilized for the washing and concentration of submicron (20 nm - 0.5 µm) microspheres.

ViaCheck™ 25% Viability427

ViaCheck™ Viability and Concentration Standards are part of our extensive line of microsphere standards for instrument QC. ViaCheck™ standards mimic the light scattering characteristics of “live” and “dead” cells in the trypan blue dye exclusion method, and may be used to confirm the capabilities and verify the performance of image-based cell viability instruments.

Quantum™ QC428

Quantum™ QC is a multi-intensity, multi-fluorescent standard that is intended for use as an in-depth tool for daily cytometer QC, and is appropriate for use with all lasers and detectors.





Polysciences, Inc. is a world leader in the development of particle-based solutions for diagnostics, bioprocessing and instrument standardization. Our capabilities in life sciences, coupled with our expertise in specialty chemicals and electronics, allow us to address the unique requirements of advanced applications in medical devices, biosensors and nanotechnology.

Polysciences offers the most comprehensive range of particle solutions in the industry. We are your source for organic, inorganic, biodegradable, magnetic, fluorescent, dyed and specific antibody and general protein coated particles in diameters spanning the range of 40nm to 10mm.

Our line of BioMag® products include superparamagnetic particles and kits that offer superior performance in the isolation and purification of nucleic acids, antibodies and other proteins. Specific cell populations may be enriched or depleted using our range of BioMag® anti-CD marker particles.

Polysciences manufactures a comprehensive range of standards for analytical instruments such as cell analyzers, particle sizers and fluorescence microscopes. Our NIST Traceable Particle Size Standards feature low coefficients of variation, which make these particles suitable for use in a wide range of applications including instrument calibration, particulate testing, filter challenge and clean room testing. Our catalog also includes SureCount™ Particle Count Standards, ViaCheck™ Viability and Concentration Controls, and a broad range of fluorescent and antibody capture beads for flow cytometric and imaging applications.

Please check our website for the latest product additions, and feel free to contact us regarding our custom services.

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General Catalog

Microspheres are routinely used in the life sciences for applications including test and assay development and bioseparations, and as instrument and process standards. Many different types of spheres are available to address the diverse and evolving needs of research and clinical studies – polymer, silica and magnetic compositions, with different surface chemistries in a range of sizes. Beads offer a large specific surface area for binding, and permit efficient capture and isolation of target. They are highly amenable to automation and miniaturization, which has been important for traditional uses, and essential for growth in developing areas such as proteomics, biophotonics and biosensing.

The pages that follow include many varieties of microspheres that are suitable for the development of test and assay reagents and standards, and also illustrate our capabilities for custom and OEM manufacturing.

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General Catalog

Polymer Microspheres

Polybead® Microspheres

Polybead® Microspheres are monodisperse polystyrene microspheres, available in sizes with nominal diameters from 50nm to 90µm. Diameters 4.5µm and larger are crosslinked with divinylbenzene (DVB). Our experienced chemists control the synthesis to provide precise monodisperse particle size distributions. These particles contain a slight anionic charge from sulfate ester.

Most of our Polybead® microspheres are packaged in economical 2.5% solids (w / v) aqueous suspensions with minimal surfactant in the final preparation. Polybead® microspheres are ideally suited for protein binding using passive adsorption techniques, and surfactant-free formulations are available on a custom basis.

Polybead® Non-functionalized Microspheres

Polybead® Microspheres A2dmw

Technical Data Sheets #788 & #238E

Nom. Dia.	CV%	Catalog #	Size
0.05µm	≤15	08691-10	10 ml
0.10µm	≤15	00876-15	15 ml
0.20µm	≤8	07304-15	15 ml
0.35µm	≤5	07306-15	15 ml
0.50µm	≤3	07307-15	15 ml
0.75µm	≤3	07309-15	15 ml
1.00µm	≤3	07310-15	15 ml
1.50µm	≤5	17133-15	15 ml
2.00µm	≤5	19814-15	15 ml
3.00µm	≤5	17134-15	15 ml
4.50µm	≤7	17135-5	5 ml
6.00µm	≤10	07312-5	5 ml
10.0µm	≤10	17136-5	5 ml
15.0µm	≤10	18328-5	5 ml
20.0µm	≤10	18329-5	5 ml
25.0µm	≤10	07313-5	5 ml
45.0µm	≤10	07314-5	5 ml
75.0µm	≤10	24049-5	5 ml
90.0µm	≤10	07315-5	5 ml

Polybead® Microspheres, Dry Form A2g

Our freeze-drying technique reduces the aggregation usually associated with dried beads. Dry material allows for the buffer of choice to be easily added.

Nom. Dia.	Catalog #	Size
1.00µm	19518-500	500 mg
1.50µm	19519-500	500 mg
3.00µm	19520-500	500 mg

Polybead® Sampler Kit I A2dmw

Kit Contains: 5ml of standard monodisperse polystyrene microspheres (2.5% solids [w / v] in water) for each of these nominal sizes: 0.5µm, 0.75µm, 1.0µm, 2.0µm and 3.0µm. Technical Data Sheets #788 & #238E



Catalog # Size

08691-10 10 ml
00876-15 15 ml
07304-15 15 ml
07306-15 15 ml
07307-15 15 ml
07309-15 15 ml
07310-15 15 ml
17133-15 15 ml
19814-15 15 ml
17134-15 15 ml
17135-5 5 ml
07312-5 5 ml
17136-5 5 ml
18328-5 5 ml
18329-5 5 ml
07313-5 5 ml
07314-5 5 ml
24049-5 5 ml
07315-5 5 ml

19518-500 500 mg
19519-500 500 mg
19520-500 500 mg
19822-1 1 kit

General Catalog

Polybead® Sampler Kit II *A2dmw*
Kit Contains: A hollow fiber filter-based separation device for washing and handling small particles, plus 5ml of standard monodisperse polystyrene microspheres (2.5% solids [w / v] in water) for each of these nominal sizes: 0.1µm, 0.2µm, 0.5µm and 1.0µm. Technical Data Sheets #788 & #238E

Polybead® Sampler Kit III *A2dmw*
Kit Contains: 1ml of standard monodisperse polystyrene microspheres (2.5% solids [w / v] in water) for each of these nominal sizes: 0.05µm, 0.20µm, 0.50µm, 1.0µm, 45.0µm and 90.0µm. Technical Data Sheets #788 & #238E

For additional Non-functionalized Polystyrene Microspheres, see our Polyballs collection, page 413.

Polybead® Functionalized Microspheres

Polybead® Carboxylate Microspheres *A2dmw*
Polybead® Carboxylate Microspheres are monodisperse polystyrene microspheres that contain surface carboxyl groups. This allows for covalent binding of proteins to the bead surface. Packaged as 2.5% solids (w / v) aqueous suspensions. Technical Data Sheets #644 & #238C

Nom. Dia.	CV%		
0.05µm	≤15	15913-10	10 ml
0.10µm	≤15	16688-15	15 ml
0.20µm	≤8	08216-15	15 ml
0.35µm	≤5	21753-15	15 ml
0.50µm	≤3	09836-15	15 ml
0.75µm	≤3	07759-15	15 ml
1.00µm	≤3	08226-15	15 ml
2.00µm	≤5	18327-10	10 ml
3.00µm	≤5	09850-5	5 ml
4.50µm	≤7	17140-5	5 ml
6.00µm	≤10	17141-5	5 ml
10.0µm	≤10	18133-2	2 ml
20.00µm	≤15	24811-2	2 ml

Polybead® Carboxylate Sampler Kit I *A2dmw*
Kit Contains: 5ml of carboxylate polystyrene monodisperse microspheres (2.5% solids in water) for each of these nominal sizes: 0.5µm, 0.75µm, 1.0µm, 2.0µm and 3.0µm.

Polybead® Carboxylate Sampler Kit II *A2dmw*
Kit Contains: A hollow fiber filter-based separation device for washing and handling small particles, and 5ml of carboxylate monodisperse polystyrene microspheres (2.5% solids in water) for each of these nominal sizes: 0.1µm, 0.2µm, 0.35µm and 0.5µm.

See PolyLink Protein Coupling Kit for Carboxylate Microspheres (Cat. #24350), page 408.

Catalog # Size

21756-1 1 kit

16905-1 1 kit

15913-10 10 ml

16688-15 15 ml

08216-15 15 ml

21753-15 15 ml

09836-15 15 ml

07759-15 15 ml

08226-15 15 ml

18327-10 10 ml

09850-5 5 ml

17140-5 5 ml

17141-5 5 ml

18133-2 2 ml

24811-2 2 ml

19819-1 1 kit

21757-1 1 kit



General Catalog

Polybead® Amino Microspheres *A2dmw*

Polybead® Amino Microspheres are monodisperse polystyrene microspheres that contain surface primary amine groups. Protein coupling using glutaraldehyde as a coupling agent will result in protein binding 11-12 carbon atoms from the surface of the bead. Packaged as 2.5% solids (w / v) aqueous suspensions.

Nom. Dia.	CV%	Catalog #	Size
0.10µm	≤25	16586-5	5 ml
0.20µm	≤20	15699-5	5 ml
0.50µm	≤11	07763-5	5 ml
0.75µm	≤8	17144-5	5 ml
1.00µm	≤6	17010-5	5 ml
3.00µm	≤8	17145-5	5 ml
6.00µm	≤10	19118-2	2 ml

Polybead® Amino Sampler Kit *A2dmw*

Kit Contains: 5ml of amino polystyrene monodisperse microspheres (2.5% solids in water) for each of these nominal sizes: 0.5µm, 0.75µm, 1.0µm and 3.0µm.

19820-1 1 kit

See Glutaraldehyde Kit with Hollow Fiber Filtering System, (Cat. #23964), page 408; also see Glutaraldehyde Kit for Amino and Blue Dyed Microspheres, (Cat. #19540), page 408.

Polybead® Carboxy-Sulfate Microspheres *A2dmw*

Polybead® Carboxy-Sulfate Microspheres are monodisperse, surfactant-free polystyrene microspheres. We manufacture these particles to have sulfate charge groups in addition to carboxyl groups. Packaged as 2.5% solids (w / v) aqueous suspensions. Nom. Dia.: 1.00µm

19406-15 15 ml

Polybead® Sulfate Microspheres *A2dmw*

Polybead® Sulfate Microspheres are monodisperse polystyrene particles that offer a higher level of surface sulfate groups than our standard polystyrene microspheres. Packaged as 2.5% aqueous suspensions.

Nom. Dia.	Catalog #	Size
0.20µm	19402-15	15 ml
0.50µm	19403-15	15 ml
1.00µm	19404-15	15 ml
2.00µm	19405-10	10 ml

Polybead® Hydroxylate Microspheres *A2dmw*

Polybead® Hydroxylate Microspheres are monodisperse particles that contain surface hydroxyl groups. These particles are packaged in an economical suspension of 2.5% solids in water.

Nom. Dia.	Catalog #	Size
0.20µm	15717-15	15 ml
0.50µm	07762-15	15 ml
0.75µm	19128-15	15 ml
1.00µm	17142-15	15 ml
2.00µm	19129-10	10 ml
3.00µm	17143-5	5 ml



Microspheres & Particles

General Catalog

Polybead® Acrylate Microspheres *A2dmw*
Polybead® Acrylate Microspheres are monodisperse microspheres (2.5% solids in water) with surfaces that contain copolymers of styrene and an acrylic ester. The reactive ester sites on the polymer will furnish points for further organic reactions, which may lead to innovative forms of activation (e.g. reaction with ammonia may lead to amide formation, which may then undergo Beckmann rearrangement). **Nom. Dia.:** 1µm

If coating is your interest, please see pages 408 - 411 for our Accessory Reagents.

Polybead® Dyed Microspheres

Polysciences is the leading supplier of visibly dyed polystyrene microspheres to the latex diagnostic marketplace. Diagnostic manufacturers rely on our precisely controlled particle synthesis to ensure reproducibility in both assay design and performance. Packaged as 2.5% solids (w / v) aqueous suspensions, they are available in a variety of nominal mean diameters and colors.

Polybead® Black Dyed Microspheres *A2dmw*



Nom. Dia.

0.20µm	24290-15	15 ml
0.50µm	24291-15	15 ml
1.00µm	24287-15	15 ml
3.00µm	24292-15	15 ml
6.00µm	24293-5	5 ml
10.0µm	24294-2	2 ml

Polybead® Polystyrene Blue Dyed Microspheres *A2dmw*

Blue Dyed Microspheres have amine groups and can be used for covalent coupling procedures using glutaraldehyde.



Nom. Dia.

0.20µm	15706-15	15 ml
0.50µm	15709-15	15 ml
1.00µm	15712-15	15 ml
3.00µm	17138-15	15 ml
6.00µm	15715-5	5 ml
10.0µm	18138-2	2 ml

Catalog # Size

18602-15 15 ml



General Catalog

Polybead® Polystyrene Violet Dyed Microspheres *A2dmw*



Nom. Dia.	Catalog #	Size
0.50µm	24064-15	15 ml
0.80µm	24065-15	15 ml
1.00µm	18134-15	15 ml
3.00µm	18135-15	15 ml
6.00µm	18136-5	5 ml
10.0µm	18139-2	2 ml

Polybead® Polystyrene Red Dyed Microspheres *A2dmw*



Nom. Dia.	Catalog #	Size
0.20µm	15705-15	15 ml
0.50µm	15708-15	15 ml
1.00µm	15711-15	15 ml
3.00µm	17137-15	15 ml
6.00µm	15714-5	5 ml

Polybead® Polystyrene Yellow Dyed Microspheres *A2dmw*



Nom. Dia.	Catalog #	Size
0.20µm	15707-15	15 ml
0.50µm	15710-15	15 ml
1.00µm	15713-15	15 ml
3.00µm	17139-15	15 ml
6.00µm	15716-5	5 ml
10.0µm	18337-2	2 ml

Polybead® Blue Dyed Microsphere Sampler Kit *A2dmw*
 Kit Contains: 5ml of blue dyed monodisperse polystyrene microspheres (2.5% solids in water) for each of these nominal size: 0.2µm, 0.5µm, 1.0µm and 3.0µm.

19821-1 4 x 5 ml



Microspheres & Particles

General Catalog

Polybead® Dyed Microsphere Kit I *A2dmw*
Kit Contains: 1ml of dyed ~1.0µm monodisperse polystyrene microspheres (2.5% solids in water) for each of these colors: red, blue, yellow, violet and unlabeled.

Polybead® Dyed Microsphere Kit II *A2dmw*
Kit Contains: 1ml of dyed and fluorescent ~1.0µm monodisperse polystyrene microspheres (2.5% solids in water) for each of these colors: red, blue, yellow and violet, as well as Fluoresbrite® YG, BB, YO, PC Red and unlabeled.

Be sure to check out our Dyed Protein Coated Microspheres, pages 398 - 399.

Polybead® Carboxylate Dyed Microspheres

Polybead® Carboxylate Blue Dyed Microspheres *A2dmw*



Nom. Dia.

0.30µm

0.50µm

1.00µm

3.00µm

6.00µm

Catalog # Size

16906-1 1 kit

18336-1 1 kit

11975-15 15 ml

19816-15 15 ml

19120-15 15 ml

19123-5 5 ml

19126-5 5 ml

Polybead® Carboxylate Red Dyed Microspheres *A2dmw*



Nom. Dia.

0.30µm

0.50µm

1.00µm

3.00µm

6.00µm

24063-15 15 ml

19815-15 15 ml

19119-15 15 ml

19122-5 5 ml

19125-5 5 ml

Polybead® Carboxylate Orange Dyed Microspheres *A2dmw*



Nom. Dia.

0.20µm

1.00µm

13369-15 15 ml

13368-15 15 ml

General Catalog

Polybead® Carboxylate Yellow Dyed Microspheres A2dmw



Nom. Dia.

0.50µm

1.00µm

3.00µm

6.00µm

Catalog # Size

19817-15 15 ml

19121-15 15 ml

19124-5 5 ml

19127-5 5 ml

Polybead® Carboxylate Green Dyed Microspheres A2dmw



Nom. Dia.

0.20µm

1.00µm

13371-15 15 ml

13370-15 15 ml

If coating is your interest, please see pages 408 - 411 for our Accessory Reagents.

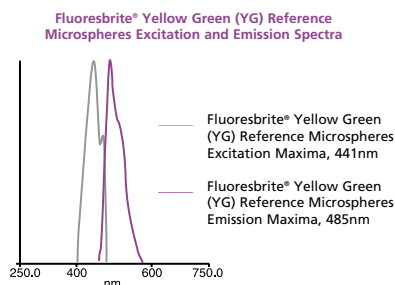
Fluoresbrite® Fluorescent Microspheres

Fluoresbrite® Microspheres

Instrument manufacturers and major diagnostic companies turn to Polysciences for our consistently superior Fluoresbrite® fluorescent polystyrene microspheres. The continued developments by our polymer chemists have resulted in products that lead the market in such applications as diagnostic assays, protein-binding assays, cell tracking and flow cytometry. These microspheres are supplied in sizes with nominal diameters from 50nm to 90µm and packaged as 2.5% solids (w / v) aqueous suspensions. Our dyes match popular filter settings: BB = DAPI, PC RED = Phycoerythrin, YG = FITC, YO = Rhodamine.

Fluoresbrite® Yellow Green (YG) Microspheres A2dmw

Fluoresbrite® Yellow Green (YG) Microspheres have excitation and emission spectra similar to FITC with excitation maxima of 441nm and emission maxima at 485nm. They are one of the brightest microspheres available at this wavelength and are used extensively in phagocytosis studies, flow cytometry and diagnostic assays.



Nom. Dia.

0.05µm

0.10µm

0.20µm

0.50µm

0.75µm

17149-10 10 ml

17150-10 10 ml

17151-10 10 ml

17152-10 10 ml

17153-10 10 ml

General Catalog

Fluoresbrite® Yellow Green (YG) Microspheres, cont.

Nom. Dia.	Catalog #	Size
1.00µm	17154-10	10 ml
2.00µm	18338-5	5 ml
3.00µm	17155-2	2 ml
6.00µm	17156-2	2 ml
10.0µm	18140-2	2 ml
20.0µm	19096-2	2 ml
25.0µm	18241-2	2 ml
45.0µm	18242-2	2 ml
90.0µm	18243-2	2 ml

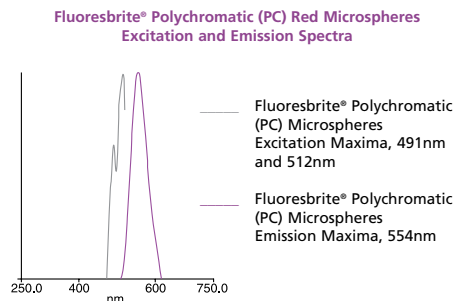
Fluoresbrite® Yellow Green (YG) Microspheres, Calibration Grade *A2dmw*

This special grade of Fluoresbrite® Yellow Green (YG) Microspheres has been evaluated both for particle diameter and the uniformity of the fluorescent dye distribution. Instrument manufacturers have demanded these high quality particles for their flow cytometry standards.

Nom. Dia.	Catalog #	Size
0.50µm	18859-1	1 ml
1.00µm	18860-1	1 ml
2.00µm	18604-1	1 ml
3.00µm	18861-1	1 ml
6.00µm	18862-1	1 ml

Fluoresbrite® Polychromatic Red Microspheres *A2dmw*

Fluoresbrite® Polychromatic Red Microspheres will fluoresce in different colors, depending on the light source and filters used. When viewed under a UV light source, the beads will appear as vivid orange. Microscopic viewing using a 475 - 490nm filter shows an extremely bright red fluorescence, while use of a 545 - 610nm filter yields a yellow fluorescence with excitation maxima of 491nm and 512nm and emission maxima at 554nm.



Nom. Dia.	Catalog #	Size
0.50µm	19507-5	5 ml
1.00µm	18660-5	5 ml
2.00µm	19508-2	2 ml
6.00µm	19111-2	2 ml

Fluoresbrite® Multifluorescent Microspheres *A2dmw*

Offered in three sizes, each microsphere is dyed with three different fluorescent dyes with excitation maxima of 377, 517 and 588nm and emission maxima of 479, 546 and 612nm, respectively. Packaged as 2.5% solids (w / v) aqueous suspensions.

Nom. Dia.	CV%	Catalog #	Size
0.20µm	5	24050-5	5 ml
0.50µm	3	24054-5	5 ml
1.00µm	3	24062-5	5 ml



General Catalog

Fluoresbrite® PolyFluor® Microspheres A2dmw

Fluoresbrite® PolyFluor® Microspheres incorporate a series of polymerizable fluorescent compounds which produce fluorescence at a variety of wavelengths. These microspheres have a nominal diameter of 1.0µm. The fluorescence is uniformly distributed throughout the outer 25% of the radii of the particles. Packaged as 2.5% solids (w / v) aqueous suspensions.

	Nom. Dia.	Ex. Max. (nm)	Em. Max. (nm)
345 Microspheres	1.0µm	285	345
394 Microspheres	1.0µm	339	394
407 Microspheres	1.0µm	362	407
497 Microspheres	1.0µm	355	497
511 Microspheres	1.0µm	470	511
512 Microspheres	1.0µm	439	512
570 Microspheres	1.0µm	548	570

See page 392 for our Polybead® Dyed Microsphere Kit II, and don't forget our Fluorescence Reference Standards, pages 439 - 440.

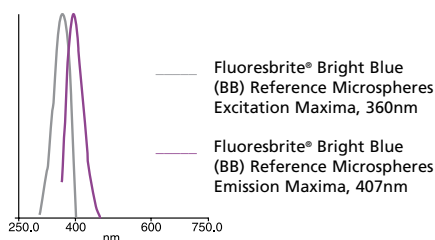
Fluoresbrite® Carboxylate Microspheres

Fluoresbrite® Carboxylate Microspheres are fluorescent monodisperse polystyrene microspheres that have carboxylate groups on their surfaces that can be activated for the covalent coupling of proteins. Polysciences' Fluoresbrite® particles are used extensively in phagocytosis and neural retrograde transport studies, and as markers for cell bound antigens. Packaged as 2.5% solids (w / v) aqueous suspensions.

See page 408 for our PolyLink Protein Coupling Kit (Cat. #24350).

Fluoresbrite® Bright Blue (BB) Carboxylate Microspheres A2dmw

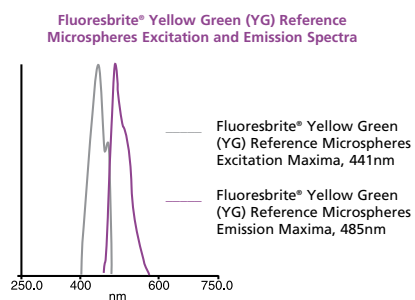
Fluoresbrite® Bright Blue (BB) Reference Microspheres Excitation and Emission Spectra



Nom. Dia.		
0.05µm	19773-10	10 ml
0.10µm	19774-10	10 ml
0.50µm	18339-10	10 ml
1.00µm	17458-10	10 ml
1.75µm	17686-5	5 ml
4.50µm	18340-5	5 ml
6.00µm	19102-2	2 ml
10.0µm	19103-2	2 ml

General Catalog

Fluoresbrite® Yellow Green (YG) Carboxylate Microspheres A2dmw

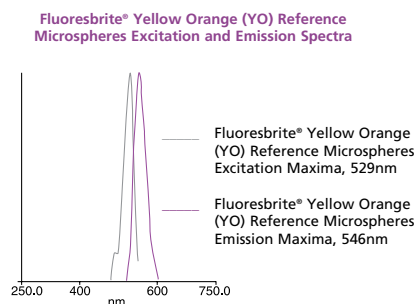


Nom. Dia.

0.05µm	16661-10	10 ml
0.10µm	16662-10	10 ml
0.20µm	09834-10	10 ml
0.30µm	24051-10	10 ml
0.35µm	24052-10	10 ml
0.40µm	24053-10	10 ml
0.50µm	15700-10	10 ml
0.75µm	07766-10	10 ml
1.00µm	15702-10	10 ml
1.50µm	09719-10	10 ml
1.75µm	17687-5	5 ml
2.00µm	09847-5	5 ml
3.00µm	17147-5	5 ml
4.50µm	16592-5	5 ml
6.00µm	18141-2	2 ml
10.0µm	18142-2	2 ml

Fluoresbrite® Yellow Orange (YO) Carboxylate Microspheres A2dmw

YO has limited water solubility and some leaching may occur with rigorous washing.



Nom. Dia.

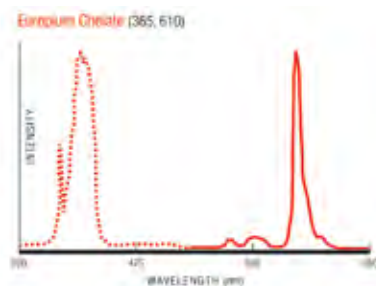
0.05µm	19775-10	10 ml
0.10µm	18719-10	10 ml
0.20µm	19391-10	10 ml
0.50µm	18720-10	10 ml
1.00µm	18449-10	10 ml
1.75µm	19392-5	5 ml
3.00µm	19393-5	5 ml
4.50µm	19394-5	5 ml
6.00µm	19395-2	2 ml



General Catalog

Fluoresbrite® Europium (Eu) Chelate Carboxylate Microspheres *A2dmw*

Polysciences offers Fluoresbrite® Europium (Eu) Chelate Carboxylate Microspheres in diameters of 0.1µm, 0.2µm and 0.3µm to address the needs of individual assays, including immunochromatographic and microwell-based formats. Our Europium products offer extremely bright fluorescence and exceptional stability, in addition to well-functionalized carboxylated surfaces for the covalent attachment of ligand. **Ex. max = 365nm Em. max = 610nm** Technical Data Sheet #915



Nom. Dia.

0.10µm	25488-1	1 ml
0.10µm	25488-5	5 ml
0.10µm	25488-10	10 ml
0.20µm	25489-1	1 ml
0.20µm	25489-5	5 ml
0.20µm	25489-10	10 ml
0.30µm	25490-1	1 ml
0.30µm	25490-5	5 ml
0.30µm	25490-10	10 ml

Fluoresbrite® Carboxylate Particles and Kits

Fluoresbrite® Carboxylate Color Range Kit I *A2dmw*

Kit Contains: 1ml each of ~1.75µm Fluoresbrite® monodisperse polystyrene microspheres (2.5% solids [w / v] in aqueous suspension) containing dyes with these excitation maxima: 273nm, 360nm, 441nm, 529nm, 641nm and 763nm.



18326-1 1 kit

Fluoresbrite® Carboxylate Color Range Kit II *A2dmw*

Kit Contains: 1ml each of ~0.50µm Fluoresbrite® monodisperse polystyrene microspheres (2.5% solids [w / v] in aqueous suspension) containing dyes with these excitation maxima: 273nm, 360nm, 441nm, 529nm, 641nm and 763nm.

19839-1 1 kit

Fluoresbrite® Carboxylate Size Range Kit I *A2dmw*

Polysciences' Size Range Kits allow you to evaluate which fluorescent particle size performs optimally for your specific application. These yellow green (YG) beads are economically packaged in 1ml volumes.

Kit Contains: 1ml of Fluoresbrite® monodisperse microspheres (2.5% solids in water) for each of these nominal sizes: 0.10µm, 0.20µm, 0.50µm, 0.75µm and 1.0µm.

21636-1 1 kit

Fluoresbrite® Carboxylate Size Range Kit II *A2dmw*

Polysciences' Size Range Kits allow you to evaluate which fluorescent particle size performs optimally for your specific application. These yellow green (YG) beads are economically packaged in 1ml volumes.

Kit Contains: 1ml of Fluoresbrite® monodisperse microspheres (2.5% solids in water) for each of these nominal sizes: 1.75µm, 2.0µm, 3.0µm, 4.5µm and 6.0µm.

21637-1 1 kit

See page 392 for our Polybead® Dyed Microsphere Kit II and page 398 for protein-conjugated versions of these products, and don't forget our Flow Cytometry Fluorescence Reference Standards, pages 428 - 430.



Microspheres & Particles

General Catalog

Protein Conjugated Microspheres

We offer antibodies, Protein A and Protein G covalently coupled to fluorescent YG, non-fluorescent and blue dyed polystyrene microspheres. Antibody-conjugated microspheres can be used to detect and deplete trace amounts of specific antigens in solution. Microspheres coupled with Protein A and Protein G will bind to the Fc portion of antibodies raised in most mammals. Technical Data Sheet #615

Our protein conjugated microspheres have a nominal diameter of 1.0µm and are packaged as 1.25% solids (w / v) aqueous suspensions. Proteins of your choice can be coupled to microspheres on a custom basis.

Streptavidin Conjugated Microspheres *A2dmw*

Requires Cold Pack.

Streptavidin is covalently coupled to undyed and Fluoresbrite® YG (excitation: 441nm, emission: 486nm) polystyrene microspheres. Packaged as 1.25% solids (w / v) aqueous suspensions. Technical Data Sheet #616

	Nom. Dia.	Catalog #	Size
Undyed Microspheres	1.0µm	24162-1	1 ml
	1.0µm	24162-5	5 ml
	2.0µm	24160-1	1 ml
	2.0µm	24160-5	5 ml
	6.0µm	24158-1	1 ml
	6.0µm	24158-5	5 ml
Fluoresbrite® YG Microspheres	1.0µm	24161-1	1 ml
	1.0µm	24161-5	5 ml
	2.0µm	24159-1	1 ml
	2.0µm	24159-5	5 ml
	6.0µm	24157-1	1 ml
	6.0µm	24157-5	5 ml

Biotin Conjugated Microspheres *A2dmw*

Biotin is covalently coupled to undyed and Fluoresbrite® YG (excitation: 441nm, emission: 486nm) polystyrene microspheres. Packaged as 1.25% solids (w / v) aqueous suspensions. Technical Data Sheet #616

	Nom. Dia.	Catalog #	Size
Undyed Microspheres	2.0µm	24172-1	1 ml
	2.0µm	24172-5	5 ml
Fluoresbrite® YG Microspheres	2.0µm	24173-1	1 ml
	2.0µm	24173-5	5 ml

Protein A Microspheres *A2dmx*

Requires Cold Pack.

	Nom. Dia.	Catalog #	Size
Undyed Microspheres	1.0µm	17698-1	1 ml
Blue Dyed Microspheres	1.0µm	17699-1	1 ml
Fluoresbrite® YG Microspheres	1.0µm	17845-1	1 ml



General Catalog

Protein G Microspheres A2dmx

Requires Cold Pack.

	Nom. Dia.	Catalog #	Size
Undyed Microspheres	1.0µm	21106-1	1 ml
Blue Dyed Microspheres	1.0µm	21105-1	1 ml
Fluoresbrite® YG Microspheres	1.0µm	21107-1	1 ml

Goat anti-Mouse IgG (H&L) Microspheres A2dmx

Requires Cold Pack.

	Nom. Dia.	Catalog #	Size
Undyed Microspheres	1.0µm	17694-1	1 ml
Blue Dyed Microspheres	1.0µm	17697-1	1 ml
Fluoresbrite® YG Microspheres	1.0µm	17843-1	1 ml

Goat anti-Rabbit IgG (H&L) Microspheres A2dmx

Requires Cold Pack.

	Nom. Dia.	Catalog #	Size
Undyed Microspheres	1.0µm	17693-1	1 ml
Blue Dyed Microspheres	1.0µm	17696-1	1 ml
Fluoresbrite® YG Microspheres	1.0µm	17844-1	1 ml

Ligand coated silica microspheres are also available (page 400), as well as BioMag® (pages 418 - 422) and ProMag™ (pages 402 - 404) microspheres.

Silica Microspheres

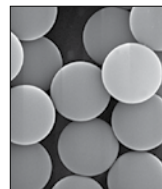
Silica Microspheres, Colloidal A2dmw

Colloidal silica products are offered as 5% solids dispersions of amorphous silica particles in water with NaOH as a stabilizer. Like our larger silica microspheres, colloidal silica particles may be functionalized by reaction with organosilanes. Technical Data Sheet #792

	Nom. Dia.	% Solids	Catalog #	Size
Silica Microspheres (broad distribution, colloidal)	0.01µm	5	24298-10	10 ml
Silica Microspheres (colloidal)	0.05µm	5	24040-10	10 ml
	0.10µm	5	24041-10	10 ml

Silica Microspheres, Plain (Hydrophilic) A2dmw

Uniform, non-porous silica (SiO₂) microspheres are available in diameters of ~150nm - 5µm. These particles typically have size CVs of 10 - 15%. Inorganic supports such as silica microspheres have become increasingly important for a variety of applications, including isolation of nucleic acids, cell separation and immuno- and DNA-based assays. They offer the combined benefits of a bead platform and the unique properties of a silica substrate such as: flexible silanization chemistries, low autofluorescence and low nonspecific binding of many biomolecules. Technical Data Sheet #635



	Nom. Dia.	% Solids	Catalog #	Size
	0.15µm	10	24320-15	15 ml
	0.3µm	10	24321-15	15 ml
	0.4µm	10	24322-15	15 ml
	0.5µm	10	24323-15	15 ml



Microspheres & Particles

General Catalog

Silica Microspheres, Plain (Hydrophilic), cont.

Nom. Dia.	% Solids	Catalog #	Size
0.7µm	10	24324-15	15 ml
0.9µm	10	24325-15	15 ml
1.0µm	10	24326-15	15 ml
1.5µm	10	24327-15	15 ml
2.0µm	10	24328-15	15 ml
2.5µm	10	24329-15	15 ml
3.0µm	10	24330-15	15 ml
4.0µm	10	24331-15	15 ml
5.0µm	10	24332-15	15 ml

Silica Microspheres, Dry A2g

Monodisperse silica microspheres in dry form. Available in nominal diameters ranging from: 0.3 - 6.0µm. Technical Data Sheet #635

Nom. Dia.	Catalog #	Size
0.3µm	25341-1.5	1.5 g
0.5µm	25342-1.5	1.5 g
1.0µm	25343-1.5	1.5 g
1.5µm	25344-1.5	1.5 g
2.5µm	25345-1.5	1.5 g
3.0µm	25346-1.5	1.5 g
4.0µm	25347-1.5	1.5 g
5.0µm	25348-1.5	1.5 g

Silica Microspheres, Amine A2g

Amine functionalized, 100% solids. Available with nominal diameters from 0.5 - 5.0µm to allow the researcher to tailor his / her product design for specific assays. Technical Data Sheet #635

Nom. Dia.	Catalog #	Size
0.5µm	24756-1	1 g
1.0µm	24757-1	1 g
5.0µm	24758-1	1 g

Silica Microspheres, Carboxyl A2g

Carboxylic Acid functionalized, 100% solids. Available with nominal diameters from 0.5 - 5.0µm to allow the researcher to tailor his / her product design for specific assays. Technical Data Sheet #635

Nom. Dia.	Catalog #	Size
0.5µm	24753-1	1 g
1.0µm	24754-1	1 g
5.0µm	24755-1	1 g

Silica Microspheres, Streptavidin A2dmw

Streptavidin coated, 1% solids. Streptavidin modified microspheres bind biotinylated ligands easily and with great affinity. Offered as a 1% dispersion in water. Available with nominal diameters from 0.5 - 5.0µm. Technical Data Sheet #635

Nom. Dia.	Catalog #	Size
0.5µm	24759-2	2 ml
1.0µm	24760-2	2 ml
5.0µm	24761-2	2 ml

Please see page 415 for our selection of Glass Beads.



General Catalog

QuantumPlex™ Multiplexing Platforms

The microsphere populations in QuantumPlex™ five-bead kits are encoded with different intensities of Starfire Red™, and microspheres in our ten-bead kits are distinguished by both fluorescence intensity and size. Starfire Red™ is a fluorescent dye with unique characteristics that make it ideal for multiplexing applications. The dye's broad excitation band allows it to be excited at a number of wavelengths, and it emits in the red channel (e.g. PE-Cy™5, APC) with very little carry-over into lower wavelengths, leaving other detectors available for determination of positive binding events via common reporters such as FITC and PE.

QuantumPlex™ kits are available with three different surfaces to accommodate the coating strategy of choice: carboxyl or streptavidin. Technical Data Sheets #PDS 215 and #PDS 235

QuantumPlex™ A2dmw

	Nom. Dia.	Data Points	Catalog #	Size
Carboxyl (5 dye intensities)	4.4µm	100	BLI235A-1	5 x 1 ml
	4.4µm	500	BLI235B-5	5 x 5 ml
	4.4µm	1000	BLI235C-10	5 x 10 ml
	5.5µm	100	BLI238A-1	5 x 1 ml
	5.5µm	500	BLI238B-5	5 x 5 ml
	5.5µm	1000	BLI238C-10	5 x 10 ml
Carboxyl (2 x 5 dye intensities)	4.4 & 5.5µm	200	BLI239A-1	10 x 1 ml
	4.4 & 5.5µm	1000	BLI239B-5	10 x 5 ml
	4.4 & 5.5µm	2000	BLI239C-10	10 x 10 ml
Streptavidin (5 dye intensities)	4.4µm	100	BLI215A-1	5 x 1 ml
	4.4µm	500	BLI215B-5	5 x 5 ml
	4.4µm	1000	BLI215C-10	5 x 10 ml
	5.5µm	100	BLI218A-1	5 x 1 ml
	5.5µm	500	BLI218B-5	5 x 5 ml
	5.5µm	1000	BLI218C-10	5 x 10 ml
Streptavidin (2 x 5 dye intensities)	4.4 & 5.5µm	200	BLI219A-1	10 x 1 ml
	4.4 & 5.5µm	1000	BLI219B-5	10 x 5 ml
	4.4 & 5.5µm	2000	BLI219C-10	10 x 10 ml

QuantumPlex™ SP A2dmw

QuantumPlex™ SP (Single Population) is useful for the development of simplex flow cytometric assays, or the optimization of attachment chemistry and assay parameters before transitioning to a multiplexed format. Technical Data Sheets #PDS 214 and #PDS 234

	Nom. Dia.	Catalog #	Size
Carboxyl	4.4µm	BLI234A-1	1 ml
	4.4µm	BLI234B-3	3 ml
	5.5µm	BLI237A-1	1 ml
	5.5µm	BLI237B-3	3 ml
Streptavidin	4.4µm	BLI214A-1	1 ml
	4.4µm	BLI214B-3	3 ml
	5.5µm	BLI217A-1	1 ml
	5.5µm	BLI217B-3	3 ml



Microspheres & Particles

General Catalog

QuantumPlex™M A2dmw

QuantumPlex™M is an innovative magnetic bead kit for multiple analyte detection research applications in flow cytometry. QuantumPlex™M results in flexible, efficient and cost-effective research. The carboxyl populations are at a concentration of $\sim 1 \times 10^8$ beads/ml, while the streptavidin populations are at a concentration of $\sim 1 \times 10^6$ beads/ml. Technical Data Sheets #PDS 250 and #PDS 252

	Nom. Dia.	Catalog #	Size
Carboxyl (5 dye intensities)	~6µm Magnetic	BLI250A-1	5 x 1 ml
	~6µm Magnetic	BLI250B-5	5 x 5 ml
	~6µm Magnetic	BLI250C-10	5 x 10 ml
Streptavidin (5 dye intensities)	~6µm Magnetic	BLI252A-1	5 x 1 ml
	~6µm Magnetic	BLI252B-5	5 x 5 ml
	~6µm Magnetic	BLI252C-10	5 x 10 ml

QuantumPlex™M SP A2dmw

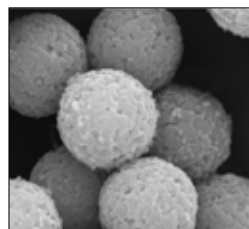
QuantumPlex™M is also available as a Single Population. Technical Data Sheets #PDS 251 and #PDS 253

	Nom. Dia.	Catalog #	Size
Carboxyl	~6µm Magnetic	BLI251A-1	1 ml
	~6µm Magnetic	BLI251B-3	3 ml
Streptavidin	~6µm Magnetic	BLI253A-1	1 ml
	~6µm Magnetic	BLI253B-3	3 ml

Magnetic Microspheres and Particles

ProMag™ HC

ProMag™ HC (High Capacity) 1 µm is our latest advancement in magnetic particles. Intended for high capacity isolations, design parameters include high surface area and functionality.



New! ProMag™ 1 HC COOH

Storage: Store between 4 - 8° C

Intended for high capacity isolations, design parameters include high surface area and functionality. Their magnetic separation profile ensures complete and reproducible separations. Carboxyl and Streptavidin surface chemistries support a range of research and commercial applications in the life sciences. Technical Data Sheet #PDS #745

25992-10	10 ml
25992-25	25 ml
25992-50	50 ml
25992-100	100 ml

New! ProMag™ HC 1 Series Streptavidin

Storage: Store between 4 - 8° C

Intended for high capacity isolations, design parameters include high surface area and functionality. Their magnetic separation profile ensures complete and reproducible separations. Carboxyl and Streptavidin surface chemistries support a range of research and commercial applications in the life sciences. Technical Data Sheet #PDS #745

25993-1	1 ml
25993-2	2 ml
25993-5	5 ml
25993-10	10 ml



General Catalog

ProMag™ HP

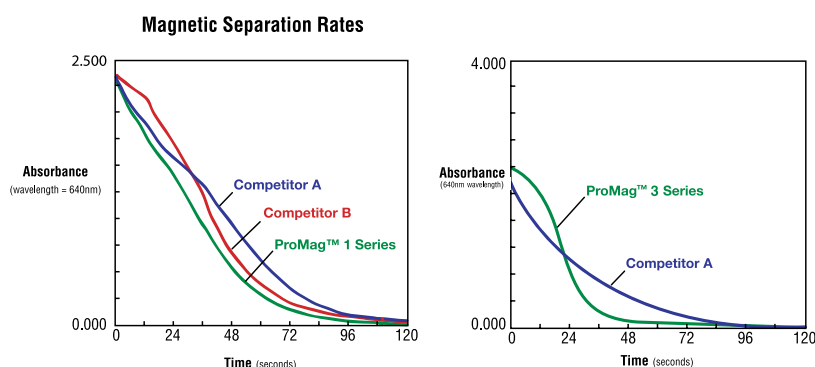
Introducing ProMag™ High Performance (HP), a new generation of magnetic microspheres engineered for use in your most sensitive assays. In addition to superior handling and coating characteristics, ProMag™ HP possess the exceptionally low background chemiluminescence and stringent iron sequestration needed to achieve highest signal-to-noise ratios. Technical Data Sheet #1003

ProMag™ HP Carboxyl A2dmw

	Nom. Dia.	% Solids	Catalog #	Size
3 Series	3µm	2.5	25509-5	5 ml
	3µm	2.5	25509-25	25 ml

ProMag™

Offered in 1µm and 3µm diameters, ProMag™ are polymer-based magnetic spheres that support diagnostic applications requiring highly uniform, high-binding beads and fast separation times. ProMag™ also have a proprietary surface to reduce nonspecific binding in protein-based systems. Technical Data Sheet #755



ProMag™ Carboxyl Surfactant-Free A2dmw

	Nom. Dia.	% Solids	Catalog #	Size
1 Series	1µm	2.5	25029-5	5 ml
	1µm	2.5	25029-25	25 ml
3 Series	3µm	2.5	86055-5	5 ml
	3µm	2.5	86055-25	25 ml

ProMag™ Amine A2dmw

	Nom. Dia.	% Solids	Catalog #	Size
1 Series	1µm	2.5	25511-5	5 ml
	1µm	2.5	25511-25	25 ml
3 Series	3µm	2.5	25510-5	5 ml
	3µm	2.5	25510-25	25 ml

ProMag™ Streptavidin Microspheres A2dmw

	Nom. Dia.	% Solids	Catalog #	Size
1 Series	1µm	1	25031-1	1 ml
	1µm	1	25031-2	2 ml
	1µm	1	25031-5	5 ml
	1µm	1	25031-10	10 ml



Microspheres & Particles

General Catalog

3 Series

Nom. Dia.	% Solids	Catalog #	Size
3µm	1	86056-1	1 ml
3µm	1	86056-2	2 ml
3µm	1	86056-5	5 ml
3µm	1	86056-10	10 ml

ProMag™ Protein G A2dmw

3 Series

Nom. Dia.	% Solids	Catalog #	Size
3µm	1	25512-1	1 ml
3µm	1	25512-2	2 ml
3µm	1	25512-5	5 ml
3µm	1	25512-10	10 ml

ProMag™ Goat anti-Mouse IgG (Fc) A2dmw

3 Series

Nom. Dia.	% Solids	Catalog #	Size
3µm	1	25513-1	1 ml
3µm	1	25513-2	2 ml
3µm	1	25513-5	5 ml
3µm	1	25513-10	10 ml

Amino Superparamagnetic Microparticles A2dmw

Iron-containing microparticles have a polystyrene surface which allows for passive adsorption and covalent attachment. They will respond to a magnetic field, will easily resuspend when the field is removed, and are useful in a variety of applications that require fast, gentle separation during washing and isolation procedures. These particles are packaged as 2.5% solids (w / v) aqueous suspensions. **Nom. Dia.:** ~1 - 2µm Technical Data Sheet #438

18879-2 2 ml
18879-5 5 ml

Fluorescent YG Superparamagnetic Microparticles A2dmw

Iron-containing microparticles have a polystyrene surface which allows for passive adsorption and covalent attachment. They will respond to a magnetic field, will easily resuspend when the field is removed, and are useful in a variety of applications that require fast, gentle separation during washing and isolation procedures. These particles are packaged as 2.5% solids (w / v) aqueous suspensions. **Nom. Dia.:** ~1 - 2µm Technical Data Sheet #438

19133-2 2 ml
19133-5 5 ml

BioMag®, BioMag®Plus and BioMag® Maxi

BioMag®, BioMag®Plus and BioMag® Maxi are high performance superparamagnetic microparticles widely used for the efficient separation of cells and purification of biomolecules. We offer three BioMag® particle types: BioMag®, BioMag®Plus and BioMag® Maxi. BioMag® are ~1.5µm, while BioMag®Plus are ~1.0µm and BioMag® Maxi particles are ~6µm.

BioMag® Functionalized

BioMag® Amine Magnetic Immobilization Kit A2dmw

The BioMag® Magnetic Immobilization Kit works with our BioMag® Amine particles to conjugate your proteins to magnetic amine particles.

Kit Contains: Unconjugated BioMag® Amine particles (Cat. #84100), BioMag® Flask Separator (Cat. #84101S) and ultrapure glutaraldehyde for conjugating your protein.



84001K-1 1 kit



General Catalog

BioMag® Amine A2dmw

Concentration	Stoichiometry
50 mg/ml	240 µmol/g
50 mg/ml	240 µmol/g

Catalog # Size

84100-10 10 ml
84100-100 100 ml

BioMag®Plus Amine A2dmw

BioMag®Plus Amine particles offer a high level of amine functionality on magnetically responsive particles. Covalent attachment of proteins can be done via a reaction with glutaraldehyde. Provided as a suspension at 50 mg/ml. Technical Data Sheet #617

86001-10 10 ml
86001-100 100 ml

BioMag®Plus Amine Protein Coupling Kit HOV6d

The BioMag®Plus Amine Protein Coupling Kit provides all reagents necessary for the covalent attachment of proteins to BioMag®Plus Amine superparamagnetic particles. Contents of kit are sufficient for five coupling reactions.

86000-1 1 kit

Kit Contains: 25ml BioMag®Plus Amine (Cat. #86001), 2 x 10ml glutaraldehyde (EM Grade, 25%), 5 x 50ml conical centrifuge tubes, BioMag® MultiSep Magnetic Separator (Cat. #85200-1), 2 x 125ml Pyridine Wash Buffer (PWB), 2 x 125ml Quenching Solution (1M Glycine, pH 8.0) and 125ml Wash Buffer. Technical Data Sheet #617

BioMag® Carboxyl A2dmw

Concentration	Stoichiometry
20 mg/ml	240 µmol/g
20 mg/ml	240 µmol/g

84125-10 10 ml
84125-100 100 ml

BioMag®Plus Carboxyl A2dmw

BioMag®Plus Carboxyl superparamagnetic particles are provided for the covalent attachment of proteins using carbodiimide (EDAC method). Provided as a suspension at 20 mg/ml. Technical Data Sheet #618

86011-10 10 ml

BioMag®Plus Carboxyl Protein Coupling Kit HO6bd

The BioMag®Plus Carboxyl Protein Coupling Kit includes all of the reagents necessary for the covalent attachment of proteins to BioMag®Plus Carboxyl superparamagnetic particles. Contents of kit are sufficient for five coupling reactions.

86010-1 1 kit

Kit Contains: 2.5ml BioMag®Plus Carboxyl (Cat. #86011), 0.10g EDAC (1-ethyl-3-(3-dimethylaminopropyl)carbodiimide), 5 x 15ml conical centrifuge tubes, BioMag® MultiSep Magnetic Separator (Cat. #85200-1), 2 x 175ml 0.05M MES buffer (pH 5.2), 25ml Quenching Solution (1.0M Glycine, pH 8.0) and 125ml Wash Buffer. Technical Data Sheet #618

BioMag® Maxi, ~6µm A2dmw

BioMag® Maxi are irregularly shaped iron oxide particles of ~6µm in size. It has been shown that larger, denser particles are more efficient in immunomagnetic capture assays, especially in viscous solutions. Technical Data Sheet #722

	Concentration
Amine	50 mg/ml
Carboxyl	20 mg/ml

84140-10 10 ml
84130-10 10 ml

BioMag® Binding Proteins

BioMag® Streptavidin A2dmw

Requires Cold Pack.

Concentration
5 mg/ml
5 mg/ml

84660-5 5 ml
84660-50 50 ml



Microspheres & Particles

General Catalog

BioMag®Plus Streptavidin *A2dmw*
Requires Cold Pack.
BioMag®Plus Streptavidin Particles are a suspension of superparamagnetic particles approximately 1µm in size, covalently attached to streptavidin. BioMag®Plus Streptavidin allows for capture of biotinylated oligonucleotides, proteins, dNTPs and other molecules. Provided as a suspension at ~5mg per ml. Technical Data Sheet #621

BioMag®Plus Streptavidin / Biotin Binding Starter Kit *A2dmw*
Requires Cold Pack.
This kit contains all reagents needed for the attachment of biotinylated proteins to BioMag®Plus superparamagnetic particles. Contents of kit are sufficient for 5 coupling reactions.
Kit Contains: 5ml of BioMag®Plus Streptavidin (Cat. #86031), 250ml Coupling / Wash Buffer, BioMag® MultiSep Magnetic Separator (Cat. #85200-1) and 5 x 15ml conical centrifuge tubes.
Technical Data Sheet #621

BioMag® Streptavidin, Nuclease-Free *A2dmw*
Requires Cold Pack.
BioMag® Streptavidin, Nuclease-Free is a suspension of BioMag® Streptavidin particles for immobilizing biotinylated nucleic acids.

BioMag® Biotin *A2dmw*
Requires Cold Pack.

Concentration
5 mg/ml

BioMag® Proteins A & G *A2dm*
Requires Cold Pack.

Concentration

Protein A	5 mg/ml	84600-2	2 ml
	5 mg/ml	84600-10	10 ml
Protein G	5 mg/ml	84605-2	2 ml
	5 mg/ml	84605-10	10 ml

BioMag®Plus Concanavalin A *A2dmw*
Requires Cold Pack.
BioMag®Plus Concanavalin A (Con A) coated microparticles provide a convenient means for isolating mannosyl and glucosyl-containing glycoproteins and polysaccharides from serum or cell lysate, or for investigating other lectin / glycan-mediated processes. The BioMag®Plus magnetic particle format provides high surface area and permits easy and efficient separations. Technical Data Sheet #766

BioMag®Plus Wheat Germ Agglutinin *A2dmw*
Requires Cold Pack.
The unique saccharide-binding properties of plant lectins, such as wheat germ agglutinin (WGA), have made them useful for the study of glycosylated proteins. Lectins have been used in cell adhesion studies, to effect lymphocyte activation, and to explore carbohydrate-based therapeutics.
Our WGA-coated BioMag®Plus microparticles provide a convenient means for isolating N-acetylglucosamine-containing glycoproteins from cell lysate or to explore other lectin / glycan-mediated processes. The BioMag®Plus magnetic particle format provides high surface area, and permits easy and efficient separations. Technical Data Sheet #759

Catalog # Size

86031-10 10 ml

86030-1 1 kit

8MB4804-10 10 ml
8MB4804-25 25 ml
8MB4804-1 100 ml

84640-5 5 ml

84600-2 2 ml
84600-10 10 ml
84605-2 2 ml
84605-10 10 ml

86057-3 3 ml
86057-10 10 ml

86054-3 3 ml
86054-10 10 ml



General Catalog

BioMag® Secondary Antibody Particles

BioMag® Secondary Antibody Particles A2dmw
Requires Cold Pack.

	Concentration	Binding Capacity	Catalog #	Size
Goat anti-Human IgG	1 mg/ml	>0.10 mg/ml	84320-50	50 ml
Goat anti-Human IgG (Fc Specific)	5 mg/ml	>0.20 mg/ml	84324-50	50 ml
Goat anti-Human IgM	1 mg/ml	>0.15 mg/ml	84325-50	50 ml
Goat anti-Mouse IgG	1 mg/ml	>0.20 mg/ml	84340-50	50 ml
	1 mg/ml	>0.20 mg/ml	84340-500	500 ml
Goat anti-Mouse IgG (Fc Specific)	5 mg/ml	>0.15 mg/ml	84344-50	50 ml
	5 mg/ml	>0.15 mg/ml	84344-500	500 ml
Goat anti-Mouse IgM	1 mg/ml	>0.20 mg/ml	84350-50	50 ml
	1 mg/ml	>0.20 mg/ml	84350-500	500 ml
Goat anti-Rabbit IgG	1 mg/ml	>0.20 mg/ml	84300-50	50 ml
	1 mg/ml	>0.20 mg/ml	84300-500	500 ml
Goat anti-Rat IgG	1 mg/ml	>0.15 mg/ml	84330-50	50 ml
	1 mg/ml	>0.15 mg/ml	84330-500	500 ml
Goat anti-Rat IgG (Fc Specific)	5 mg/ml	>0.20 mg/ml	84334-50	50 ml
	5 mg/ml	>0.20 mg/ml	84334-500	500 ml
Goat anti-Rat IgM	5 mg/ml	>0.10 mg/ml	84335-50	50 ml
	5 mg/ml	>0.10 mg/ml	84335-500	500 ml

BioMag®Plus Secondary Antibody Particles & Kits

BioMag®Plus Goat anti-Mouse IgG Secondary Antibody Particles A2dmw
Requires Cold Pack.
Concentration: 1 mg/ml Binding Capacity: >0.20 mg/ml Technical Data Sheet #619

86021-50 50 ml

BioMag®Plus Goat anti-Mouse IgG Particle Antibody Coupling Starter Kit A2dmw ..
Requires Cold Pack.
This kit includes all of the reagents for the attachment of antibodies to BioMag®Plus superparamagnetic particles. Contents of the kit are sufficient for five binding reactions.
Kit Contains: 25ml BioMag®Plus anti-Mouse IgG (Cat. #86021), 250ml Coupling / Wash Buffer, 5 x 15ml conical centrifuge tubes and BioMag® MultiSep Magnetic Separator (Cat. #85200-1).
Technical Data Sheet #619

86020-1 1 kit

BioMag® Dextran-coated Charcoal

BioMag® Dextran-coated Charcoal A2dmw

	Concentration	Catalog #	Size
Charcoal	5 mg/ml	84510-100	100 ml
Charcoal Concentrate	50 mg/ml	84555-1	1000 ml

BioMag® Superparamagnetic Iron Oxide

BioMag® Superparamagnetic Iron Oxide, ~10µm A2dmw
This is a suspension of iron oxide magnetic particles approximately 10µm in size. Suspension is supplied in deionized water. Magnetization: 25 - 35 EMU / gram (EMU=electromagnetic units) measured at a field of 1000 gauss. Concentration: 50mg/ml

84200-10 10 ml

Please see page 416 for our other magnetic iron powder and page 415 for iron oxide particles.



General Catalog

Accessory Reagents & Companion Products

Protein Coupling Kits

PolyLink Protein Coupling Kit *HO6bf*

The PolyLink Protein Coupling Kit enables researchers to quickly couple proteins to carboxylated microspheres in two hours or less. The procedure provided with the kit has been optimized for polymer microspheres 1µm or larger.

Kit Contains: 55ml Coupling Buffer, 45ml Wash / Storage Buffer and 0.75g EDAC. Each kit is sufficient for 50 coupling reactions of 200-500g of protein per reaction. *No beads are included in this kit.* Technical Data Sheet #644



Catalog #	Size
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24350-1	1 kit
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PolyLink Kit with Hollow Fiber Filtering System *BVW7dw*

The PolyLink Kit with Hollow Fiber Filtering System includes a hollow fiber separation device to aid in the washing and isolation steps. Microspheres of 0.1µm - 0.5µm diameter can be handled easily without laborious high speed centrifugation techniques. For microspheres less than 0.1µm, use the PolyLink Protein Coupling Kit (Cat. #24350) with Vivaspin® ultrafiltration devices (Cat. #BLIAA022-5) or dialysis tubing. *No beads are included in this kit.* Technical Data Sheets #606 and #853



24818-1	1 kit
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Glutaraldehyde Kit for Amino Beads & Blue Dyed Beads *BIX7dw*

This kit contains 3 x 225ml Phosphate Buffered Saline, 2 x 10ml ampoules 25% EM Grade Glutaraldehyde, 60ml 0.2M Ethanamine in Phosphate Buffered Saline, 60ml Bovine Serum Albumin solution, 60ml Storage Buffer and a labeled mixing and storage bottle. *No beads are included in this kit.* Technical Data Sheets #238G and #410

Glutaraldehyde Kit with Hollow Fiber Filtering System *BIX7dw*

This kit includes a hollow fiber separation device to aid in the washing and isolation steps. Microspheres of 0.1µm - 0.5µm diameter can be handled easily without laborious high speed centrifugation techniques. Device may not be suitable for microspheres smaller than 0.1µm. For microspheres smaller than 0.1µm, use the Glutaraldehyde Kit for Amino Beads & Blue Dyed Beads (Cat. #19540) along with Vivaspin® ultrafiltration devices (Cat. #BLIAA022-5) or dialysis tubing. *No beads are included in this kit.* Technical Data Sheets #238G and #606

19540-1	1 kit
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23964-1	1 kit
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Microsphere Coating Reagents

DEPC-Carbodiimide (EDAC) *Af*

EDAC is a zero-length crosslinker that is routinely used for the covalent binding of amine-containing ligands to carboxylated microspheres. Technical Data Sheet #911

BLI5288-1	1 g
BLI5288-5	5 g

Glutaraldehyde, EM Grade, 25% [111-30-8] *HOV6d*

Glutaraldehyde, EM Grade, 25%, is a homobifunctional linker that is suitable for binding amine-containing ligands to amine-modified beads. We supply EM (electron microscopy) grade glutaraldehyde in ampoules to ensure the highest activity. Each ampoule is fitted with an ampoule cracker for added safety. Technical Data Sheet #911

BLI1909-10	10 x 10 ml
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Buffers & Solutions

Bead Coupling & Storage Buffers *Ad*

Polysciences' Bead Coupling and Storage Buffers are ready-to-use buffers that are available in a variety of pH levels (4.5 to 9.0). They can be used as coupling or wash buffers for plain, dyed or functionalized polymer microspheres. Technical Data Sheet #794





General Catalog

	pH Level	Catalog #	Size
Coupling Buffer	4.5	24976-250	250 ml
	4.5	24976-500	500 ml
	4.5	24976-1000	1000 ml
	4.5	24976-2000	2000 ml
	6.0	24977-250	250 ml
	6.0	24977-500	500 ml
	6.0	24977-1000	1000 ml
	6.0	24977-2000	2000 ml
	7.4	24974-250	250 ml
	7.4	24974-500	500 ml
	7.4	24974-1000	1000 ml
	7.4	24974-2000	2000 ml
	9.0	24978-250	250 ml
	9.0	24978-500	500 ml
	9.0	24978-1000	1000 ml
	9.0	24978-2000	2000 ml
Storage Buffer	7.4	24979-250	250 ml
	7.4	24979-500	500 ml
	7.4	24979-1000	1000 ml
	7.4	24979-2000	2000 ml
	8.5	24975-250	250 ml
	8.5	24975-500	500 ml
	8.5	24975-1000	1000 ml
	8.5	24975-2000	2000 ml
Bead Solution <i>Ad</i>		24973-500	500 ml
Polysciences' Bead Solution is a ready-to-use aqueous suspending solution for the dilution and/or storage of your uncoated plain, dyed or functionalized polymer microspheres (both carboxylated or aminated). An antimicrobial agent deters microbial contamination, and stabilizers promote suspension dispersity, peace of mind and harmonious accord in the laboratory. Technical Data Sheet #793		24973-1000	1000 ml
		24973-2000	2000 ml
Surfactants			
Triton® X-100 Nonionic Surfactant <i>HV5g</i>		BLI4605-10	10 g
A nonionic surfactant, Triton® X-100 is often used in the storage buffers of coated bead suspensions. Very low concentrations may be used in wash or binding buffers if needed (e.g. 0.0005%). Technical Data Sheet #912			
Tween® 20 Nonionic Surfactant <i>A2g</i>		BLI6110-10	10 g
A nonionic surfactant, Tween 20® is often used in the storage buffers of coated bead suspensions. Very low concentrations may be used in wash or binding buffers if needed (e.g. 0.0005%). Technical Data Sheet #912			
Sodium Dodecyl Sulfate (SDS) Anionic Surfactant		BLI3945-10	10 g
SDS is an anionic surfactant, which will decrease polymer bead hydrophobicity and can additionally participate in charge stabilization of the suspension. SDS is a more rigorous surfactant than is commonly used in uncoated polymer bead preparations. Technical Data Sheet #912			



General Catalog

Magnetic Separators

BioMag® 12 x 75mm Test Tube Separator

The BioMag® 12 x 75mm Test Tube Separator holds sixty 12 x 75mm tubes for radio-immunoassays or other applications. BioMag® particles pellet at the bottom of the test tube. Technical Data Sheets #573 and #796



Catalog #	Size
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84104S-1	1 unit
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BioMag® 15ml / 50ml Tube Separator

The BioMag® 15ml / 50ml Tube Separator holds five 15ml tubes and three 50ml tubes for cell storing, small-scale ligand attachment and other applications. Technical Data Sheets #572 and #796



84102S-1	1 unit
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BioMag® Flask Separator

For use with tissue culture flasks, each BioMag® Flask Separator measures 12.5 x 6cm. For more concentrated solutions of BioMag® particles, two units are recommended, one on each side of the flask.

Technical Data Sheets #571 and #796



84101S-1	1 unit
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BioMag® MultiSep Magnetic Separator

The BioMag® MultiSep Magnetic Separator is well suited for labs that do not need to perform simultaneous multiple magnetic particle separations and is a convenient and economical alternative to having a specific magnetic separator for each tube size. The MultiSep can be used with 50ml, 15ml or 1.5ml centrifuge tubes. Technical Data Sheets #791 and #796



85200-1	1 unit
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BioMag® Multi-6 Microcentrifuge Tube Separator

This separator holds six 1.5ml microcentrifuge tubes for separations of 20 - 500µl. Technical Data Sheets #576 and #796



8MB4111S-1	1 unit
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BioMag® Multi-32 Microcentrifuge Tube Separator

The BioMag® Multi-32 Microcentrifuge Tube Separator is suitable for molecular biology applications of 0.5 - 1.5ml. Sixteen tubes in the inner row are magnetically separated while the sixteen in the outer row are held outside the field for mixing and pipetting.

Technical Data Sheets #574 and #796



84106S-1	1 unit
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General Catalog

BioMag® Solo-Sep Microcentrifuge Tube Separator

The BioMag® Solo-Sep Microcentrifuge Tube Separator holds one 1.5ml microcentrifuge tube for molecular biology separations of 20 - 500µl. Technical Data Sheets #577 and #796



BioMag® 96-Well Plate Separator

The BioMag® 96-Well Plate Separator is suitable for most 96-well plate applications. Particles pellet at the bottom of the plate. Technical Data Sheets #575 and #796



BioMag® 96-Well Plate Side Pull Magnetic Separator

The BioMag® 96-Well Plate Side Pull Magnetic Separator is designed to work with plates that allow magnetic pins to fit between the wells. This allows BioMag® and BioMag®Plus superparamagnetic particles to be pulled to the side of the wells, giving better access to the bottom of the wells for more complete fluid removal and less chance of particle aspiration. Consists of 24 permanent Neodymium-Iron-Boron rod magnets. Each magnet addresses four wells of a 96-well plate. Technical Data Sheets #575 and #796



Neodymium Iron Magnet

This rare earth magnet is a Neodymium-Iron-Boron (NdFeB) block magnet. It measures 1" square and 0.5" thick.

New! Vivaspin® Ultrafiltration Device

Vivaspin® Concentrators are disposable ultrafiltration devices that may be utilized for the washing and concentration of submicron (20 nm - 0.5 µm) microspheres. Technical Data Sheet #PDS #AA022



Catalog # Size

8MB4112S-1 1 unit

8MB4109S-1 1 unit

85072S-1 1 unit

19772-1 1 unit

BLIAA022-5 5 units

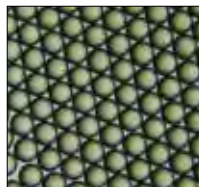
General Catalog

Additional Microspheres

Biodegradable Microspheres

Poly(Lactic Acid-co-Glycolic Acid) Uniform Dry Microspheres *HK5cd*

We offer microspheres comprised of two PLGA polymer ratios (50:50 and 75:25 Lactic Acid:Glycolic Acid) in three narrow sizes (75µm, 100µm and 120µm; 5 - 10% CVs). These highly uniform particle populations serve as excellent models for controlled degradation rate measurements, and for the development of prototype scaffolds or devices. Lyophilized to resist biodegradation. Custom quotations on other PLGA microparticles, alternative biodegradable polymer family types or microparticles with specific active components are available upon request. Technical Data Sheet #858



Composition - LA/GA	Size Range	Mol. Weight	Catalog #	Size
50:50	70 - 80µm	~150,000	25401-100	100 mg
50:50	70 - 80µm	~150,000	25401-250	250 mg
50:50	70 - 80µm	~150,000	25401-500	500 mg
50:50	95 - 105µm	~150,000	25402-100	100 mg
50:50	95 - 105µm	~150,000	25402-250	250 mg
50:50	95 - 105µm	~150,000	25402-500	500 mg
50:50	115 - 125µm	~150,000	25403-100	100 mg
50:50	115 - 125µm	~150,000	25403-250	250 mg
50:50	115 - 125µm	~150,000	25403-500	500 mg
75:25	70 - 80µm	~90,000	25398-100	100 mg
75:25	70 - 80µm	~90,000	25398-250	250 mg
75:25	70 - 80µm	~90,000	25398-500	500 mg
75:25	95 - 105µm	~90,000	25399-100	100 mg
75:25	95 - 105µm	~90,000	25399-250	250 mg
75:25	95 - 105µm	~90,000	25399-500	500 mg
75:25	115 - 125µm	~90,000	25400-100	100 mg
75:25	115 - 125µm	~90,000	25400-250	250 mg
75:25	115 - 125µm	~90,000	25400-500	500 mg

Polymer Microspheres

Polystyrene Beads, Large *A2g*

Our crosslinked Polystyrene Beads are larger than Polybeads®, yet smaller than Polyballs. We offer a full size range of polystyrene beads and can offer particles of intermediate sizes on a custom basis. Technical Data Sheet #856

Size Range	Catalog #	Size
106 - 125µm	19824-1	1 g
200 - 300µm	19825-1	1 g
355 - 425µm	19826-1	1 g
500 - 600µm	21392-1	1 g



General Catalog

Polyballs A2g

Uniform spheres with a smooth surface unless noted otherwise. Technical Data Sheet #404

	Density	Catalog #	Size
Polyamide 6/6 (Nylon), 1/16" Diameter	~1.19 g/cc	08295-100	100 balls
Polyethylene, 3/8" Diameter, Hollow	~0.53 g/cc	19529-100	100 balls
Polypropylene, 1/4" Diameter	~0.92 g/cc	16026-100	100 balls
Polystyrene, 1/8" Diameter, Etched Surface	~1.05 g/cc	17175-100	100 balls
Polystyrene, 1/8" Diameter, for Biological Applications	~1.05 g/cc	18547-100	100 balls
Polystyrene, 1/4" Diameter	~1.05 g/cc	19827-100	100 balls
Polystyrene, 1/4" Diameter, Etched Surface	~1.05 g/cc	16730-100	100 balls
	~1.05 g/cc	16730-500	500 balls
Polystyrene, 1/4" Diameter, for Biological Applications	~1.05 g/cc	18548-100	100 balls
Teflon, 1/8" Diameter	~2.14 g/cc, chemically resistant	17649-100	100 balls
Teflon, 1/4" Diameter	~2.14 g/cc, chemically resistant	17650-100	100 balls

Polyballs, Modified A2g

Our high quality Polyball polymer spheres are offered with modified surfaces to allow covalent coupling of biomolecules. One version is blue dyed for easier modification. Technical Data Sheet #404

	Density	Catalog #	Size
Polystyrene 1/8" Diameter, Carboxylate	~1.05 g/cc	19841-50	50 balls
Polystyrene 1/4" Diameter, Carboxylate	~1.05 g/cc	19840-50	50 balls
Polystyrene 1/4" Diameter, Blue Dyed	~1.05 g/cc	19842-50	50 balls

Polybead® Hollow Microspheres A2dm

Polybead® Hollow Microspheres are spherical styrene / acrylic beads supplied in suspension. A relatively dense shell of a polystyrene-based copolymer is formed around a void in the particle. Sphere voids are water-filled in the as-supplied 5% solids aqueous suspension, and the water-filled particle will have an effective density near 1.0 g/cm³. Water is lost from the void upon drying since the particles are slightly porous. This results in a hollow particle with a shell approximately 0.10µm thick. Surfactants on the surface of the microspheres help stabilize the particles. Technical Data Sheet #784

	Nom. Dia.	Catalog #	Size
	0.40µm	23567-10	10 ml
	0.55µm	23568-10	10 ml
	1.00µm	23569-10	10 ml

Polybead® Poly(methyl methacrylate) Microspheres A2dm

Poly(methyl methacrylate) or PMMA is less hydrophobic than polystyrene and should show reduced nonspecific protein and peptide binding. The density of these beads, 1.19 g/cc, is considerably higher than that of polystyrene beads, making them easier to concentrate by centrifugation. The beads are not free of surfactant and contain surface carboxylic acid groups at higher concentration than the standard Polybead® Polystyrene Carboxylate Microspheres. Technical Data Sheet #1001

	Size Range	% Solids	Catalog #	Size
Monodisperse	0.30 µm	2.5	12083-10	10 ml
Broad Distribution	1 - 10 µm	5	19130-10	10 ml
PMMA Nonionic Surfactant	0.08 - 0.13 µm	5	23571-10	10 ml
PMMA Anionic Surfactant	0.08 - 0.09 µm	5	23570-10	10 ml



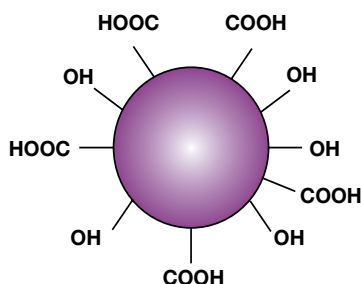
Microspheres & Particles

General Catalog

Polybead® Crosslinked Melamine Particles *A2dm*
Crosslinked by acid-catalyzed reaction with formaldehyde, the Polybead® Crosslinked Melamine Particles have a much higher density (1.51 g/cc) than polystyrene, are hydrophilic with amine and methylolamine groups and, being crosslinked, are not noticeably swelled by organic solvents. They can be lyophilized and then redispersed in water. Supplied as a suspension of 2.5% solids in water. **Nom. Dia.:** 1µm Technical Data Sheet #920

DispersEZ-300 [9002-84-0] *H4g*

A novel patented class of polytetrafluoroethylene particles, our unique DispersEZ particles have chemically treated surfaces to orient stabilizing polar moieties (both hydroxyl and carboxylic acid groups) to the exterior of the particle. These molecules, which are chemically grafted to the PTFE surface, allow the particles to disperse easily in both aqueous and solvent media without the need for added surfactants or stabilizers. The carboxyl and hydroxyl moieties on the surface of the DispersEZ particles act as synthetic handles to which a variety of chemical species can be attached. Technical Data Sheet #1000



Catalog # **Size**

23579-5 5 ml

Mean Particle Size

200 - 300nm

Surface Area

8m²/g (BET surface area measurement)

Surfactant Demand

None (self-stabilized added surfactant)

Surface Reactivity

High (concentration of accessible reactive sites versus traditional PTFE beads)

24339-50 50 g

Microdispers [9002-84-0] *H4g*

Microdispers are polytetrafluoroethylene (PTFE) particles provided in dry powder form. These particles require far less added dispersant than traditional PTFE particles to form stable dispersions and are useful for many applications including coatings, gloss reducers and coating additives that impact water pickup or surface energy. With good powder flow properties, these particles are easily compounded in a number of thermoplastic matrices with appropriate heat / shear mixing. Technical Data Sheet #1000

Mean Particle Size

200 - 300nm

3000nm (<10% of particle size distribution is above 10µm)

8000nm

24333-100 100 g

24334-100 100 g

24336-100 100 g

Phenolic Beads, Hollow

Hollow Phenolic Beads are excellent for use in a variety of industrial applications. They are lightweight, chemically inert and mechanically strong. They can be excellent adhesives, gap filling formulations, sandable putties, syntactic foams and molded and laminated structures that must be lightweight and strong. Technical Data Sheet #783

17806-100 100 g

Poly(ethyl methacrylate) Beads [9003-42-3] *A2g*

MW 50,000 Tg 65° C TSCA

These Poly(ethyl methacrylate) Beads are made of a tough methacrylate resin and are available in a size range of 140 - 220µm. Technical Data Sheet #920

03197-250 250 g

Poly(4-iodostyrene / styrene / divinylbenzene) ~58:40:2 [72330-89-3] *U4g*

Iodinated, crosslinked beads that can be further derivatized. 200 - 400 mesh Technical Data Sheet #920

18148-5 5 g

Polypropylene, Chromatographic Grade [9003-07-0] *A2g*

TSCA $[-CH_2CH(CH_3)-]_n$

Widely used polyolefin and soluble in chlorinated hydrocarbons, aromatic hydrocarbons and isoamyl acetate. Technical Data Sheet #920

Size Range

Chromatographic Grade 25 - 85µm, mp 165°, Tg -13°

25 - 85µm

04342-100 100 g

Chromatographic Grade 150µm

150µm

06068-100 100 g



General Catalog

Poly(styrene / divinyl benzene) [9003-70-7] A2g

These beads are used for preparation of crosslinked poly(chloromethylstyrene) Merrifield resins and other functionalized beads. 200-400 mesh TSCA Technical Data Sheet #920

ratio

92:8

98:2

Catalog

Size

04022-100

100 g

16724-100

100 g

Poly(tetrafluoroethylene) [9002-84-0] A2g

This inert polymer has a nominal 35µm diameter (Teflon® 7A) Technical Data Sheet #920

08816-100

100 g

Poly(4-vinylpyridine / divinylbenzene) [19017-40-7] U7g

These beads are used as an absorbent and in ion-exchange resin. Technical Data Sheet #920

06579-10

10 g

Glass Beads

Glass Beads A2g

Polysciences has a full size range of glass beads that are manufactured from specially selected soda lime glass with a density of ~2.48 g/cm³. Glass beads are supplied dry. Technical Data Sheets #758 and #857

Size Range

3 - 10µm

10 - 30µm

30 - 50µm

50 - 100µm

105 - 150µm

150 - 210µm

210 - 250µm

250 - 300µm

355 - 420µm

420 - 500µm

500 - 850µm

07666-1

1 g

07668-1

1 g

18901-100

100 g

15926-100

100 g

15927-100

100 g

05483-250

250 g

18902-100

100 g

18903-100

100 g

18905-100

100 g

18906-100

100 g

17596-250

250 g

Glass Beads, Hollow A2g

Our hollow glass beads offer the strength and stability of glass at 1.1 g/cc nominal density.

Size Range: 2 - 20µm Technical Data Sheet #744

19823-5

5 g

Glass Beads, Functionalized H3g

These are high surface area soda lime glass beads that have been functionalized by reaction with the appropriate organosilane. Prior to organosilane treatment, the surfaces of the glass particles are etched to increase the surface area. They are capable of coupling with peptides, dyes and other compounds, the amine-functional beads as supplied and the glycidyl-functional beads after periodate oxidation. Additional sizes are available on a custom basis. Technical Data Sheet #758

Size Range

Amine

30 - 50µm

23584-10

10 g

Glycidyl

30 - 50µm

23585-10

10 g

Iron Oxide Particles

Iron Oxide Particles A2g

Technical Data Sheet #605 and #607

Nom. Dia.

Black

0.2µm

17526-1

1 g

0.2µm

17526-5

5 g

Red

0.3 - 0.8µm

07674-1

1 g



Microspheres & Particles

General Catalog

Spherical Ferromagnetic Iron Powder *H2bg*
Technical Data Sheet #604

Nom. Dia.

2 - 3µm

4 - 5µm

Catalog # **Size**

19844-1

1 g

19829-1

1 g

Biologic Particles

Corn Pollen *A2g*
Size Range: 85 - 90µm Technical Data Sheet #919



07664-1

1 g

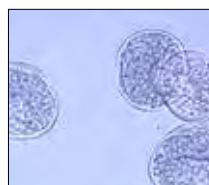
Paper Mulberry Pollen *A2g*
Size Range: 12 - 13µm Technical Data Sheet #919



07670-1

1 g

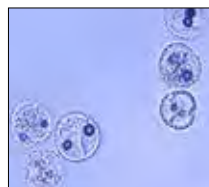
Pecan Pollen *A2g*
Size Range: 45 - 52µm Technical Data Sheet #919



07671-1

1 g

Ragweed Pollen *A4g*
Size Range: 19 - 20µm Technical Data Sheet #919



07673-1

1 g

Sporopollenin Lycopodium *A4g*
Nom. Dia.: 28µm Technical Data Sheet #281



16867-1

1 g



Magnetic Bioseparations

Magnetic microparticles offer a highly convenient means to conduct a variety of bioseparations. Particles may be coated with antibodies, lectins or oligonucleotides to effect separations of specific cell populations or target sequences, and kits and protocols are also available for nonspecific or total isolations. We offer a broad range of magnetic particle-based kits and specific coatings for the enrichment of leukocyte populations, depletion of abundant proteins from serum, and isolation of glycoproteins and nucleic acids. And if you don't see an ideal product for your work, we welcome your call to discuss custom solutions.

Cell Separations

BioMag® SelectaPure anti-Leukocyte for Human or Mouse	
BioMag® SelectaPure anti-Leukocyte for Human	418
BioMag® SelectaPure anti-Leukocyte for Mouse	418
BioMag® Negative Selection Cell Sorting Enrichment Systems	418
BioMag® Secondary Antibody Particles	419
BioMag®Plus Secondary Antibody Particles & Kits	419
BioMag®Plus Mouse anti-Fluorescein IgG	419
BioMag® Antibody Binding Proteins	419
BioMag® Proteins A & G	419
BioMag®Plus Protein A	420
BioMag®Plus Protein G	420
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Please see pages 410 - 411 for our complete selection of Magnetic Separators.

Magnetic Bioseparations

Cell Separation

BioMag® SelectaPure anti-Leukocyte for Human or Mouse

BioMag® SelectaPure anti-Human Leukocyte Particles *A2dm*

Requires Cold Pack.

BioMag® SelectaPure anti-Human CD IgG-coated particles are produced by covalently attaching murine monoclonal antibodies to BioMag® particles. The antibodies were prepared against human leukocyte differentiation antigens. Each product is supplied in phosphate buffered saline with EDTA and sodium azide added as stabilizers and should be washed in sterile media prior to use to remove the preservative.

	Concentration	Cellular Distribution	Catalog #	Size
SelectaPure anti-Human CD2	~4 mg/ml	Thymocytes, T cells	85002-5	5 ml
SelectaPure anti-Human CD3	~4 mg/ml	Pan T Mature	85003-5	5 ml
SelectaPure anti-Human CD4	~1.5 mg/ml	T Helper	85004-5	5 ml
SelectaPure anti-Human CD8	~1.5 mg/ml	Suppressor Cytotoxic T cells	85008-5	5 ml
SelectaPure anti-Human CD11b	~1 mg/ml	Activated Lymphocytes, Monocytes	85011-5	5 ml
SelectaPure anti-Human CD14	~1.5 mg/ml	Monocytes	85014-5	5 ml
SelectaPure anti-Human CD16	~4 mg/ml	NK cells	85016-5	5 ml
SelectaPure anti-Human CD19	~4 mg/ml	B Progenitors	85019-5	5 ml
SelectaPure anti-Human CD34	~4 mg/ml	Myeloid cells	85034-5	5 ml
SelectaPure anti-Human CD45	~4 mg/ml	Common Leukocyte cells	85045-5	5 ml
SelectaPure anti-Human CD56	~4 mg/ml	NK cells, Neuroectodermal cells	85056-5	5 ml
SelectaPure anti-Human CD71	~4 mg/ml	Proliferating Neoplastic cells	85071-5	5 ml

BioMag® SelectaPure anti-Mouse Leukocyte Particles *A2dm*

Requires Cold Pack.

BioMag® SelectaPure anti-Mouse particles are available for the isolation of CD4+, CD8a+ and CD45R murine lymphocytes.

	Concentration	Cellular Distribution	Catalog #	Size
anti-Mouse CD4	~1 mg/ml	T Helper	85104-5	5 ml
anti-Mouse CD8a	~1 mg/ml	Suppressor Cytotoxic T cells	85108-5	5 ml
anti-Mouse CD45R	~1 mg/ml	Restricted Leukocyte cells	85145-5	5 ml

BioMag® Negative Selection Cell Sorting Enrichment Systems

BioMag® Negative Selection Cell Sorting Enrichment Systems *A2dm*

Requires Cold Pack.

BioMag® Human T cell Enrichment Systems are available for the enrichment of CD3+, CD4+, or CD8+ T cell fractions from human peripheral blood mononuclear cells. Our enrichment systems involve the magnetic removal of subpopulations positive for other CD markers, leaving the untouched CD3+, CD4+ or CD8+ fraction available for analysis.

	Concentration	Catalog #	Size
CD3+ T cell Enrichment System	~1 mg/ml	85073-1	1 ml
	~1 mg/ml	85073-5	5 ml
CD4+ T cell Enrichment System	~1 mg/ml	85074-1	1 ml
	~1 mg/ml	85074-5	5 ml
CD8+ T cell Enrichment System	~1 mg/ml	85078-1	1 ml
	~1 mg/ml	85078-5	5 ml



Magnetic Bioseparations

BioMag® Secondary Antibody Particles

BioMag® Secondary Antibody Particles *A2dmw*
Requires Cold Pack.

	Concentration	Binding Capacity	Catalog #	Size
Goat anti-Human IgG	1 mg/ml	>0.10 mg/ml	84320-50	50 ml
Goat anti-Human IgG (Fc Specific)	5 mg/ml	>0.20 mg/ml	84324-50	50 ml
Goat anti-Human IgM	1 mg/ml	>0.15 mg/ml	84325-50	50 ml
Goat anti-Mouse IgG	1 mg/ml	>0.20 mg/ml	84340-50	50 ml
	1 mg/ml	>0.20 mg/ml	84340-500	500 ml
Goat anti-Mouse IgG (Fc Specific)	5 mg/ml	>0.15 mg/ml	84344-50	50 ml
	5 mg/ml	>0.15 mg/ml	84344-500	500 ml
Goat anti-Mouse IgM	1 mg/ml	>0.20 mg/ml	84350-50	50 ml
	1 mg/ml	>0.20 mg/ml	84350-500	500 ml
Goat anti-Rabbit IgG	1 mg/ml	>0.20 mg/ml	84300-50	50 ml
	1 mg/ml	>0.20 mg/ml	84300-500	500 ml
Goat anti-Rat IgG	1 mg/ml	>0.15 mg/ml	84330-50	50 ml
	1 mg/ml	>0.15 mg/ml	84330-500	500 ml
Goat anti-Rat IgG (Fc Specific)	5 mg/ml	>0.20 mg/ml	84334-50	50 ml
	5 mg/ml	>0.20 mg/ml	84334-500	500 ml
Goat anti-Rat IgM	5 mg/ml	>0.10 mg/ml	84335-50	50 ml
	5 mg/ml	>0.10 mg/ml	84335-500	500 ml

BioMag® Secondary Antibody Particles & Kits

BioMag®Plus Goat anti-Mouse IgG Secondary Antibody Particles *A2dmw*
Requires Cold Pack.
Concentration: 1 mg/ml Binding Capacity: >0.20 mg/ml Technical Data Sheet #619

86021-50 50 ml

BioMag®Plus Goat anti-Mouse IgG Particle Antibody Coupling Starter Kit *A2dmw* ..
Requires Cold Pack.
This kit includes all of the reagents for the attachment of antibodies to BioMag®Plus superparamagnetic particles. Contents of the kit are sufficient for five binding reactions.
Kit Contains: 25ml BioMag®Plus anti-Mouse IgG (Cat. #86021), 250ml Coupling / Wash Buffer, 5 x 15ml conical centrifuge tubes and BioMag® MultiSep Magnetic Separator (Cat. #85200-1).
Technical Data Sheet #619

86020-1 1 kit

BioMag®Plus Mouse anti-Fluorescein IgG *A2dm*
Requires Cold Pack.
BioMag®Plus Mouse anti-Fluorescein IgG particles are a suspension of superparamagnetic particles covalently coupled to Mouse anti-Fluorescein IgG antibodies. They are supplied at 1 mg/ml in Phosphate Buffered Saline (pH 7.4) with EDTA and sodium azide added as stabilizers and are used for the magnetic separation of fluoresceinated cells, components or complexes from solution.
Technical Data Sheet #692

86053-50 50 ml

BioMag® Antibody Binding Proteins

BioMag® Proteins A & G *A2dmw*
Requires Cold Pack.

	Concentration	Catalog #	Size
Protein A	5 mg/ml	84600-2	2 ml
	5 mg/ml	84600-10	10 ml
Protein G	5 mg/ml	84605-2	2 ml
	5 mg/ml	84605-10	10 ml



Microspheres & Particles

Magnetic Bioseparations

BioMag®Plus Protein A *A2dm*
 BioMag®Plus Protein A Particles are superparamagnetic particles approximately 1µm in size with Protein A covalently attached. Isolation of immunoglobulins using BioMag®Plus Protein A Particles allows isolation from small samples (50 microliters or less), as well as the option to easily scale up to larger samples. Technical Data Sheet #620

BioMag®Plus Protein G *A2dm*
 BioMag®Plus Protein G Particles are superparamagnetic particles approximately 1µm in size that have Protein G covalently attached. Isolation of immunoglobulins using BioMag®Plus Protein G particles allows isolation from small samples (50 microliters or less), as well as the option to easily scale up to larger samples. Technical Data Sheet #620

BioMag®Plus Protein A Antibody Isolation Starter Kit *A2dm*
 The kit contains all the reagents necessary for the isolation of antibodies from serum and cell culture supernatants. Contents of the kit are sufficient for five binding reactions.
Kit Contains: 2.5ml BioMag®Plus Protein A (Cat. #86041), 10 x 1.5ml microcentrifuge tubes, 50ml Protein A Binding / Wash Buffer, BioMag® SoloSep Microcentrifuge Tube Separator (Cat. #8MB4112S-1), 5ml Protein A Elution Buffer and 1ml Protein A Neutralization Buffer. Technical Data Sheet #620

BioMag®Plus Protein G Antibody Isolation Starter Kit *A2dm*
 The kit contains all the reagents necessary for the isolation of antibodies from serum and cell culture supernatants. Contents of the kit are sufficient for five binding reactions.
Kit Contains: 2.5ml BioMag®Plus Protein G (Cat. #86051), 10 x 1.5ml microcentrifuge tubes, 50ml Protein G Binding / Wash Buffer, BioMag® SoloSep Microcentrifuge Tube Separator (Cat. #8MB4112S-1), 5ml Protein G Elution Buffer and 1ml Protein G Neutralization Buffer. Technical Data Sheet #620

Protein Removal

BioMag® ProMax Albumin Removal Kit *A2dm*
 Based on patented BioMag® superparamagnetic particle technology, the ProMax Albumin Removal Kit depletes albumin from human serum samples in 30 minutes or less. ProMax Albumin Removal particles, along with optimized buffers, allow the binding and release of the less abundant proteins in serum while minimizing the binding of albumin, so that it may be washed away. The kit is supplied with all components needed for carrying out 25 procedures. Technical Data Sheet #658



BioMag® ProMax Serum IgG Removal Kit *A2dm*
 Reveal biomarkers in four easy steps. Based on patented BioMag® superparamagnetic particle technology, the ProMax Serum IgG Removal Kit selectively removes IgG from human serum samples in less than 30 minutes. The kit contains enough ProMax IgG Removal particles and optimized buffers for 10 reactions. Remove serum albumin from your IgG depleted samples with the ProMax Albumin Removal Kit. Technical Data Sheet #659



Glycan / Glycoprotein Capture

BioMag®Plus Concanavalin A *A2dmw*
 Requires Cold Pack.
 BioMag®Plus Concanavalin A (Con A) coated microparticles provide a convenient means for isolating mannosyl and glucosyl-containing glycoproteins and polysaccharides from serum or cell lysate, or for investigating other lectin / glycan-mediated processes. The BioMag®Plus magnetic particle format provides high surface area and permits easy and efficient separations. Technical Data Sheet #766

Catalog #	Size
86041-2	2 ml
86041-10	10 ml
86051-2	2 ml
86051-10	10 ml
86040-1	1 kit
86050-1	1 kit
24351-1	1 kit
24352-1	1 kit
86057-3	3 ml
86057-10	10 ml



Magnetic Bioseparations

BioMag®Plus Wheat Germ Agglutinin *A2dmw*

Requires Cold Pack.

The unique saccharide-binding properties of plant lectins, such as wheat germ agglutinin (WGA), have made them useful for the study of glycosylated proteins. Lectins have been used in cell adhesion studies, to effect lymphocyte activation, and to explore carbohydrate-based therapeutics.

Our WGA-coated BioMag®Plus microparticles provide a convenient means for isolating N-acetylglucosamine-containing glycoproteins from cell lysate or to explore other lectin / glycan-mediated processes. The BioMag®Plus magnetic particle format provides high surface area, and permits easy and efficient separations. Technical Data Sheet #759

Nucleic Acid Isolation

BioMag® Streptavidin

BioMag® Streptavidin *A2dmw*

Requires Cold Pack.

Concentration

5 mg/ml

5 mg/ml

BioMag®Plus Streptavidin *A2dmw*

Requires Cold Pack.

BioMag®Plus Streptavidin Particles are a suspension of superparamagnetic particles approximately 1µm in size, covalently attached to streptavidin. BioMag®Plus Streptavidin allows for capture of biotinylated oligonucleotides, proteins, dNTPs and other molecules. Provided as a suspension at ~5mg per ml. Technical Data Sheet #621

BioMag®Plus Streptavidin / Biotin Binding Starter Kit *A2dmw*

Requires Cold Pack.

This kit contains all reagents needed for the attachment of biotinylated proteins to BioMag®Plus superparamagnetic particles. Contents of kit are sufficient for 5 coupling reactions.

Kit Contains: 5ml of BioMag®Plus Streptavidin (*Cat. #86031*), 250ml Coupling / Wash Buffer, BioMag® MultiSep Magnetic Separator (*Cat. #85200-1*) and 5 x 15ml conical centrifuge tubes. Technical Data Sheet #621

BioMag® Streptavidin, Nuclease-Free *A2dmw*

Requires Cold Pack.

BioMag® Streptavidin, Nuclease-Free is a suspension of BioMag® Streptavidin particles for immobilizing biotinylated nucleic acids.

BioMag® mRNA Purification System

BioMag® SelectaPure mRNA Purification System *A2dm*

Requires Cold Pack.

The BioMag® SelectaPure mRNA Purification Kit is ideal for isolating mRNA from total RNA or tissue in 15 - 45 minutes depending upon sample.

Catalog # Size

86054-3 3 ml
86054-10 10 ml

84660-5 5 ml
84660-50 50 ml

86031-10 10 ml

86030-1 1 kit

8MB4804-10 10 ml
8MB4804-25 25 ml
8MB4804-1 100 ml

8MB4003K-1 1 kit



Microspheres & Particles

Magnetic Bioseparations

BioMag® Oligo (dT)20 Particles A2dm

Requires Cold Pack.

Nuclease-free BioMag® Oligo (dT)20 particles purify mRNA from total RNA, tissue and cells in 15 - 45 minutes depending upon sample.

Nucleic Acid Isolation

SNARE™ DNA Purification Systems

SNARE™ Plant Genomic DNA Purification System H2dm

The SNARE™ Plant Genomic DNA Purification System offers a rapid, cost-effective method for isolating DNA. The procedure does not require the use of organic solvents and is adaptable to different plant species. DNA Separation Particles supplied in the system are a suspension of superparamagnetic particles that bind double-stranded DNA. Once bound, the DNA-particle complex is stable. Impurities or unwanted proteins can be washed from the sample. DNA is then eluted from the DNA-particle complex, leaving a clean DNA preparation. Material for 100 isolations. Technical Data Sheet #712

SNARE™ Plasmid DNA Purification System H2dm

The SNARE™ Plasmid DNA Purification System offers a rapid, cost-effective method for isolating DNA. DNA Separation Particles supplied in the system are a suspension of superparamagnetic particles that bind double-stranded DNA. Once bound, the DNA-particle complex is stable. Impurities or unwanted proteins can be washed from the sample. The DNA is then eluted from the DNA particle complex, leaving a clean DNA preparation. Material for 100 isolations. Technical Data Sheet #711

SNARE™ Whole Blood Genomic DNA Purification System H2dm

The SNARE™ Whole Blood Genomic DNA Purification System offers a rapid, cost-effective method for isolating DNA. DNA Separation Particles supplied in the system are a suspension of superparamagnetic particles that bind double-stranded DNA. Once bound, the DNA-particle complex is stable. Impurities or unwanted proteins can be washed from the sample. DNA is then eluted from the DNA-particle complex, leaving a clean DNA preparation. Material for 100 isolations. Technical Data Sheet #710 and #710A



Catalog #	Size
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8MB4803-2	2 ml
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85082-1	1 kit
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85081-1	1 kit
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85080-1	1 kit
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Please see pages 410 - 411 for our complete selection of Magnetic Separators.



Instrument Standards

Polysciences manufactures a comprehensive range of standards for analytical instruments such as cell analyzers, particle sizers, flow cytometers and fluorescence microscopes. Our catalog includes NIST Traceable Particle Size Standards, SureCount™ Particle Count Standards, ViaCheck™ Cell Viability and Concentration Controls, and a broad range of fluorescent and antibody capture beads for flow cytometric and imaging applications. Our newest addition, the StarLight™ Calibration Slide Collection, presents an additional tool for fluorescence microscopy.

If a product that you need is not listed in the following pages, please check our website (www.polysciences.com) as our product line is continually expanding. We also invite you to contact us regarding our custom synthesis and contract manufacturing services.

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Instrument Standards

NIST Traceable Size Standards

Precision Size Standards are offered in three size groupings: Nanobead, Microbead and Megabead. They are measured on in-house instruments calibrated with NIST Standard Reference Materials. Each product is supplied with a Certificate of Traceability. The size, standard deviation, coefficient of variation and lot number are printed on the label for easy reference.

Nanobead NIST Traceable Particle Size Standards *A2dm*

Nanobead NIST Traceable Particle Size Standards are monodisperse polystyrene microspheres ranging from 40nm to 950nm. They are packaged in convenient, easy-to-use 15ml dropper bottles at 1% solids (w / v) in an aqueous suspension. Technical Data Sheet #623



	Nom. Dia.	Size Range	Catalog #	Size
	40nm	36 - 44nm	64004-15	15 ml
	50nm	45 - 55nm	64005-15	15 ml
	60nm	54 - 66nm	64006-15	15 ml
	70nm	65 - 74nm	64007-15	15 ml
	80nm	75 - 84nm	64008-15	15 ml
	90nm	85 - 94nm	64009-15	15 ml
	100nm	95 - 110nm	64010-15	15 ml
	125nm	120 - 130nm	64011-15	15 ml
	150nm	140 - 160nm	64012-15	15 ml
	200nm	190 - 210nm	64013-15	15 ml
	250nm	240 - 260nm	64014-15	15 ml
	300nm	285 - 315nm	64015-15	15 ml
	350nm	335 - 365nm	64016-15	15 ml
	400nm	380 - 420nm	64017-15	15 ml
	450nm	430 - 470nm	64018-15	15 ml
	500nm	480 - 520nm	64019-15	15 ml
	550nm	530 - 570nm	64020-15	15 ml
	600nm	580 - 620nm	64021-15	15 ml
	650nm	630 - 670nm	64022-15	15 ml
	700nm	680 - 720nm	64023-15	15 ml
	750nm	730 - 770nm	64024-15	15 ml
	800nm	780 - 820nm	64025-15	15 ml
	850nm	830 - 870nm	64026-15	15 ml
	900nm	880 - 920nm	64027-15	15 ml
	950nm	930 - 970nm	64028-15	15 ml



Instrument Standards

Microbead NIST Traceable Particle Size Standards *A2dm*

Microbead NIST Traceable Particle Size Standards are monodisperse polystyrene microspheres ranging from 1.0µm to 9.0µm. They are packaged in convenient, easy-to-use 15ml dropper bottles at 1% solids (w / v) in an aqueous suspension. Technical Data Sheet #623

Nom. Dia.	Size Range	Catalog #	Size
1.00µm	0.95 - 1.05µm	64030-15	15 ml
1.25µm	1.20 - 1.30µm	64035-15	15 ml
1.50µm	1.45 - 1.55µm	64040-15	15 ml
1.75µm	1.70 - 1.80µm	64045-15	15 ml
2.00µm	1.90 - 2.10µm	64050-15	15 ml
2.50µm	2.40 - 2.60µm	64055-15	15 ml
3.00µm	2.85 - 3.15µm	64060-15	15 ml
3.50µm	3.30 - 3.70µm	64065-15	15 ml
4.00µm	3.80 - 4.20µm	64070-15	15 ml
5.00µm	4.70 - 5.30µm	64080-15	15 ml
6.00µm	5.70 - 6.30µm	64090-15	15 ml
7.00µm	6.60 - 7.40µm	64100-15	15 ml
8.00µm	7.60 - 8.40µm	64110-15	15 ml
9.00µm	8.10 - 9.90µm	64120-15	15 ml

Megabead NIST Traceable Particle Size Standards *A2dm*

Megabead NIST Traceable Particle Size Standards are monodisperse polystyrene microspheres ranging from 10.0µm to 175.0µm. They are packaged in convenient, easy-to-use 15ml dropper bottles at 1% solids (w / v) in an aqueous suspension. Technical Data Sheet #623

Nom. Dia.	Size Range	Catalog #	Size
10.0µm	9.50 - 10.50µm	64130-15	15 ml
12.0µm	11.50 - 12.50µm	64140-15	15 ml
15.0µm	14.00 - 16.00µm	64155-15	15 ml
20.0µm	19.00 - 21.00µm	64160-15	15 ml
25.0µm	24.00 - 26.00µm	64165-15	15 ml
30.0µm	28.00 - 32.00µm	64170-15	15 ml
40.0µm	36.00 - 44.00µm	64180-15	15 ml
50.0µm	48.00 - 52.00µm	64190-15	15 ml
60.0µm	57.00 - 63.00µm	64200-15	15 ml
80.0µm	75.00 - 85.00µm	64210-15	15 ml
100.0µm	90.00 - 110.00µm	64220-15	15 ml
125.0µm	115.00 - 135.00µm	64225-15	15 ml
150.0µm	140.00 - 160.00µm	64230-15	15 ml
175.0µm	165.00 - 185.00µm	64235-15	15 ml

For cell size estimation, see our Flow Cytometry products on page 428.



Instrument Standards

Count Standards

SureCount™ Particle Count Standards A3dmw

SureCount™ Particle Count Standards are suspensions of polymer microspheres intended for the validation and monitoring of particle counters and supporting sample preparation processes. SureCount™ standards are available in diameters of 3µm, 5µm, 10µm and 15µm. Diameters are traceable to NIST Standard Reference Materials. The standards are supplied as ~1x10⁶ microspheres/ml aqueous suspensions in 10ml volumes and each bottle is provided with a Certificate of Traceability. Technical Data Sheet #852

Nom. Dia.	Catalog #	Size
3µm	25379-10	10 ml
5µm	25380-10	10 ml
10µm	25381-10	10 ml
15µm	25382-10	10 ml

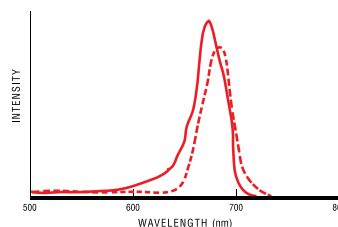
See our Flow Cytometry Absolute Count Standard™ on page 440.

Fluorescence Standards

Fluorescence Intensity Standards

Flash Red Intensity Standard A2dm

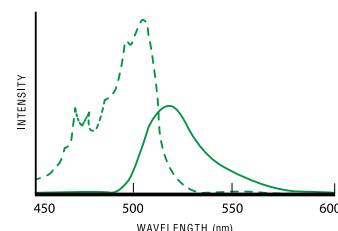
The Flash Red Intensity Standard kit consists of five populations of ~8µm microspheres dyed with increasing amounts of our Flash Red fluorophore. The different intensity populations may serve as relative intensity standards for fluorescence-based applications in microscopy or flow cytometry, and as internally-dyed beads, they will stand up to the rigors of imaging. As Flash Red is spectrally similar to Cy™5, traditional red fluorophore filter sets (e.g. Cy™5 / microscope; PE-Cy™5 or APC / cytometer) may be used with the standard. The beads may also serve as very bright relative intensity or linearity standards for flow cytometry; ask about the Bangs Laboratories, Inc. QuickCal® Linearity Template if this is your interest. Technical Data Sheet #PDS 704



Flash Red (660, 690)

Dragon Green Intensity Standard A2dm

This kit consists of five populations of ~8µm microspheres dyed with increasing amounts of our Dragon Green fluorophore. The different intensity populations may serve as relative intensity standards in fluorescent microscopy and, as internally-dyed beads, they will stand up to the rigors of imaging. Dragon Green is an excellent spectral surrogate for fluorescein and is suitable for use with fluorescein filter sets. The beads may also serve as very bright relative intensity or linearity standards for flow cytometry; ask about the Bangs Laboratories QuickCal® Linearity Template if this is your interest. Technical Data Sheet #PDS 704



Dragon Green (480, 520)

Catalog # Size

BLIFR06M-1 1 kit

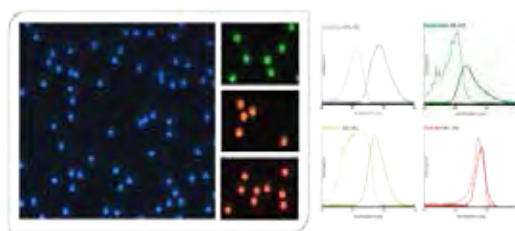
BLIDG06M-1 1 kit



Instrument Standards

StarLight™ Collection, Slide 4-Pack *abg*

Our StarLight™ Collection includes one of each of our StarLight™ Calibration slides, which feature vibrant ~6µm fluorescent microspheres dyed with a single fluorophore for basic imaging checks and calibration. The four slides are appropriate for use with common microscope filter sets:



- Glacial Blue (360, 450)
 - Dragon Green (480, 520)
 - Envy Green (525, 565)
 - Flash Red (660, 690)
- Technical Data Sheet #913

StarLight™ Calibration Individual Slides *abg*

Our new StarLight™ Calibration Slides feature vibrant ~6µm fluorescent microspheres dyed with your choice of fluorophore below for basic imaging checks and calibration.

Glacial Blue

Envy Green

Flash Red

Dragon Green

Catalog #	Size
25445-1	4 slides

25442-1	1 slide
25443-1	1 slide
25444-1	1 slide
25441-1	1 slide

For additional fluorescence products, see our Fluoresbrite® microspheres on pages 393 - 397 and our Flow Cytometry products starting on page 428.

Cell Viability

ViaCheck™ Viability and Concentration Standards

ViaCheck™ Viability and Concentration Standards are part of our extensive line of microsphere standards for instrument QC. ViaCheck™ standards mimic the light scattering characteristics of “live” and “dead” cells in the trypan blue dye exclusion method, and may be used to confirm the capabilities and verify the performance of image-based cell viability instruments. The standards are available in a range of common concentrations and live/dead ratios. Technical Data Sheets #729 & 736

ViaCheck™ Cell Viability & Concentration Controls

Technical Data Sheet #729



	Viable %	Concentration (ml)		
Cell Viability Controls	0	1 x 10 ⁶	24622-20	20 ml
	25	1 x 10 ⁶	25997-20	20 ml
	50	1 x 10 ⁶	24623-20	20 ml
	75	1 x 10 ⁶	24624-20	20 ml
	90	1 x 10 ⁶	24625-20	20 ml
	100	1 x 10 ⁶	24626-20	20 ml
Concentration Controls		1 x 10 ⁶	24627-20	20 ml



Microspheres & Particles

Instrument Standards

Viable %

Concentration (ml)

4×10^6

8×10^6

Catalog #

Size

24628-20

20 ml

24629-20

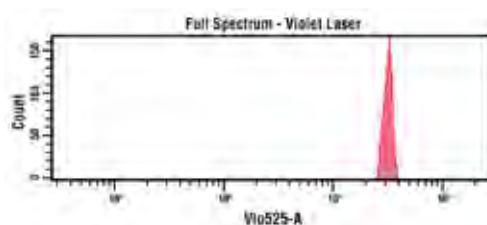
20 ml

Flow Cytometry Standards

Routine Quality Control

Full Spectrum™ adm

Multi-color Reference Standards are highly uniform microspheres which fluoresce over a broad range of the spectrum to provide several reference positions in multi-detector analysis. Used to properly align flow cytometers excited from UV to near IR, this standard emits over the entire spectrum. Technical Data Sheet #PDS 885



Tests

20

BLI885A-1

1 ml

100

BLI885B-5

5 ml

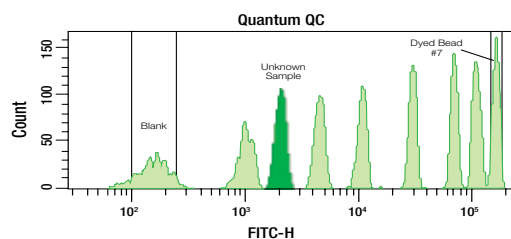
280

BLI885C-14

14 ml

New! Quantum™ QC

Quantum™ QC is a multi-intensity, multi-fluorescent standard that is intended for use as an in-depth tool for daily cytometer QC, and is appropriate for use with all lasers and detectors. It may be used to determine detection thresholds, understand resolution, and assess and track linearity of detectors. It can aid in providing confidence that the system is suitable for use, or alert operators to potential problems before samples are run. Quantum™ QC may also be used for instrument set-up to achieve standardized PMT settings and define the window of analysis for relevant detectors. Quantum™ QC is comprised of a blank and 7 (mixed) intensity populations. Quantum QC is used with a QuickCal-Linearity template that is downloaded from our website with an Access Code provided with the product at the time of shipping. Technical Data Sheet #PDS #725 & 725A



Ultra Rainbow Fluorescent Particles adm

Ultra Rainbow Fluorescent Particles are internally labeled with a mixture of fluorophores which enables them to be excited at wavelengths from 365nm to 650nm. Technical Data Sheet #PDS 612

Nom. Dia.

Tests

~3.8µm

20

BLI610A-1

1 ml

~3.8µm

100

BLI610B-5

5 ml

~3.8µm

280

BLI610C-14

14 ml

~10.2µm

20

BLI611A-1

1 ml

~10.2µm

100

BLI611B-5

5 ml

~10.2µm

280

BLI611C-14

14 ml

Fluorescence Reference Standards adm

Fluorescence Reference Standards are labeled with specific fluorochromes so that they give rise to the same fluorescence spectra as cells labeled with the same fluorochromes. Fluorescence intensity is similar to biological samples. Technical Data Sheets #PDS 890 and #PDS 892

Tests

20

BLI897A-1

1 ml

100

BLI897B-5

5 ml

280

BLI897C-14

14 ml

Acridine Orange



Instrument Standards

Fluorescence Reference Standards, cont.

	Tests	Catalog #	Size	
Alexa Fluor® 488	20	BLI886A-1	1 ml	
	100	BLI886B-5	5 ml	
	280	BLI886C-14	14 ml	
Alexa Fluor® 647	20	BLI887A-1	1 ml	
	100	BLI887B-5	5 ml	
	280	BLI887C-14	14 ml	
Allophycocyanine (APC)	20	BLI901A-1	1 ml	
	100	BLI901B-5	5 ml	
	280	BLI901C-14	14 ml	
APC-Cy™7	20	BLI914A-1	1 ml	
	100	BLI914B-5	5 ml	
	280	BLI914C-14	14 ml	
Certified Blank™ (no label)	20	BLI890A-1	1 ml	
	100	BLI890B-5	5 ml	
	280	BLI890C-14	14 ml	
Chlorophyll	20	BLI898A-1	1 ml	
	100	BLI898B-5	5 ml	
	280	BLI898C-14	14 ml	
Cy™5	20	BLI895A-1	1 ml	
	100	BLI895B-5	5 ml	
	280	BLI895C-14	14 ml	
DAPI	20	BLI906A-1	1 ml	
	100	BLI906B-5	5 ml	
	280	BLI906C-14	14 ml	
Far Out Red	20	BLI913A-1	1 ml	
	100	BLI913B-5	5 ml	
	280	BLI913C-14	14 ml	
Fluorescein	20	BLI891A-1	1 ml	
	100	BLI891B-5	5 ml	
	280	BLI891C-14	14 ml	
Hoechst 33342	20	BLI894A-1	1 ml	
	100	BLI894B-5	5 ml	
	280	BLI894C-14	14 ml	
Pacific Blue™	20	BLI916A-1	1 ml	
	100	BLI916B-5	5 ml	
	280	BLI916C-14	14 ml	
PE-Cy™5	20	BLI908A-1	1 ml	
	100	BLI908B-5	5 ml	
	280	BLI908C-14	14 ml	
PE-Cy™7	20	BLI889A-1	1 ml	
	100	BLI889B-5	5 ml	
	280	BLI889C-14	14 ml	



Microspheres & Particles

Instrument Standards

Fluorescence Reference Standards, cont.

	Tests	Catalog #	Size
PE-TR	20	BLI909A-1	1 ml
	100	BLI909B-5	5 ml
	280	BLI909C-14	14 ml
Propidium Iodide	20	BLI892A-1	1 ml
	100	BLI892B-5	5 ml
	280	BLI892C-14	14 ml
R-Phycoerythrin	20	BLI899A-1	1 ml
	100	BLI899B-5	5 ml
	280	BLI899C-14	14 ml
T.M. Rhodamine	20	BLI905A-1	1 ml
	100	BLI905B-5	5 ml
	280	BLI905C-14	14 ml
Texas Red®	20	BLI893A-1	1 ml
	100	BLI893B-5	5 ml
	280	BLI893C-14	14 ml
Violet Laser	20	BLI915A-1	1 ml
	100	BLI915B-5	5 ml
	280	BLI915C-14	14 ml

Fluoresbrite® Yellow Green (YG) Microspheres, Calibration Grade *A2dmw*

This special grade of Fluoresbrite® Yellow Green (YG) Microspheres has been evaluated both for particle diameter and the uniformity of the fluorescent dye distribution. Instrument manufacturers have demanded these high quality particles for their flow cytometry standards.

	Nom. Dia.	Catalog #	Size
	0.50µm	18859-1	1 ml
	1.00µm	18860-1	1 ml
	2.00µm	18604-1	1 ml
	3.00µm	18861-1	1 ml
	6.00µm	18862-1	1 ml

Fluoresbrite® Calibration Grade Size Range Kit *A2dmw*

Our unique synthesis methods routinely result in particles with fluorescence CV's less than 5% and often as low as 1%. This kit guarantees that our discriminating customer will have the finest particles with the lowest fluorescence CV currently available from our stock. A range of 5 sizes of Fluoresbrite® YG microspheres can be used to calibrate the green channel.

Kit Contains: 1ml at 2.5% solids for each nominal size: 0.5µm, 1.0µm, 2.0µm, 3.0µm and 6.0µm.

Time Delay Calibration Standard *ad*

Our Time Delay Calibration Standard is intended for use in assessing the delay between blue and red lasers. It features ~6µm microspheres dyed with a fluorophore that is excited with 488nm or 635nm excitation, and exhibits red / far-red emission. Technical Data Sheet #PDS 831

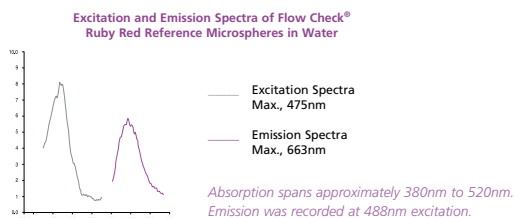
	Tests	Catalog #	Size
	20	BLI830A-1	1 ml
	100	BLI830B-5	5 ml
	280	BLI830C-14	14 ml



Instrument Standards

Flow Check™ Ruby Red Fluorescent Microspheres A2dm

Flow Check™ Ruby Red Fluorescent Microspheres are ~6µm narrow distribution polystyrene particles that can be used for flow cytometry applications where fluorescence emission in the range of 600nm to 710nm is needed. Suitable for 488nm and 663nm excitation with detection in PE-Cy™5 or APC channels. Supplied as a 5ml suspension (~5 x 10⁶ beads/ml) in a convenient dropper bottle. Ex. max: 475nm; Em. max: 663nm. Technical Data Sheet #624



Catalog # Size

24288-5 5 ml

Alignment

Right Reference Standard™ adm

Each Right Reference Standard™ consists of a single population of particles labeled with a single fluorochrome at a given reference intensity range (Low, Medium or High) which will provide a unified fluorescence range for a particular fluorescence channel. A test requires one drop (50µl) of particle suspension, which is equivalent to ~100,000 particles. Bangs Flow Cytometry Standards are 7 - 9µm in diameter (unless otherwise noted) to approximate the size of human lymphocytes. Technical Data Sheet #PDS 510

	Tests		
APC High	100	BLI521-5	5 ml
Fluorescein High	100	BLI512-5	5 ml
PE-Cy™5 High	100	BLI518-5	5 ml
Phycoerythrin High	100	BLI515-5	5 ml

Flow Check™ Yellow Green (YG) Size Range Calibration Kit

The Flow Check™ YG Size Range Calibration Kit contains suspensions of four high intensity microparticles, which have been tested under flow cytometry conditions for uniformity of size and fluorescent signal. The kit contains 10ml of each of the following nominal particle sizes: 0.5µm, 1.0µm, 2.0µm and 6.0µm (with particle concentrations as listed). The YG dye mimics the spectral properties of FITC without the leaching common to FITC. Technical Data Sheet #508

23514-1 1 kit

Flow Check™ High Intensity Alignment Grade Particles A2dm

Technical Data Sheet #508

	Nom. Dia.		
Bright Blue (BB)	0.50µm	23520-10	10 ml
Yellow Green (YG)	1.00µm	23517-10	10 ml
Yellow Green (YG)	2.00µm	23518-10	10 ml
Yellow Green (YG)	6.00µm	23519-10	10 ml

Instrument Standards

Linearity

Quantum™ MESF *adm*

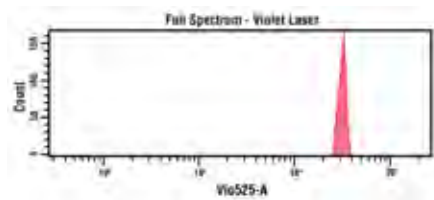
Quantum™ MESF Kits consist of a series of reference microbead standards whose intensities have been calibrated in Molecules of Equivalent Soluble Fluorochrome (MESF) units. Our FREE Flow Cytometry Data Analysis template, QuickCal®, works with all Quantum™ MESF Kits (access QuickCal® by visiting www.bangslabs.com/products/quickcal and entering the Access Number provided with your standards). A test requires one drop (50µl, ~100,000 particles) of each particle suspension. Bangs Flow Cytometry Standards are 7-9µm in diameter (unless otherwise noted) to approximate the size of human lymphocytes. Technical Data Sheet #PDS 821

	Tests	Catalog #	Size
Alexa Fluor® 488 MESF	20	BLI488A-1	1 ml
	100	BLI488B-5	5 ml
	280	BLI488C-14	14 ml
FITC-5 MESF	20	BLI555A-1	1 ml
	100	BLI555B-5	5 ml
	280	BLI555C-14	14 ml
FITC-5 MESF (Premix)	20	BLI555PA-1	1 ml
	100	BLI555PB-5	5 ml
	280	BLI555PC-14	14 ml
R-PE MESF	20	BLI827A-1	1 ml
	100	BLI827B-5	5 ml
	280	BLI827C-14	14 ml
PE-Cy™5 MESF	20	BLI828A-1	1 ml
Cy™5 MESF	20	BLI822A-1	1 ml
	100	BLI822B-5	5 ml
	280	BLI822C-14	14 ml
Alexa Fluor® 647 MESF	20	BLI647A-1	1 ml
	100	BLI647B-5	5 ml
	280	BLI647C-14	14 ml
APC MESF	20	BLI823A-1	1 ml
	100	BLI823B-5	5 ml
	280	BLI823C-14	14 ml

General Instrument Set-Up

Full Spectrum™ *adm*

Multi-color Reference Standards are highly uniform microspheres that fluoresce over a broad range of the spectrum to provide several reference positions in multi-detector analysis. Used to properly align flow cytometers excited from UV to near IR, this standard emits over the entire spectrum. Technical Data Sheet #PDS 885



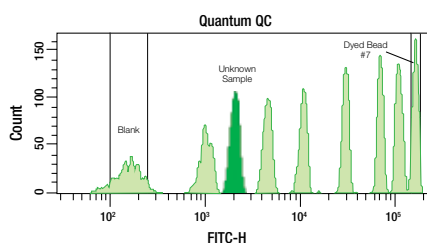
	Tests	Catalog #	Size
	20	BLI885A-1	1 ml
	100	BLI885B-5	5 ml
	280	BLI885C-14	14 ml



Instrument Standards

New! Quantum™ QC

Quantum™ QC is a multi-intensity, multi-fluorescent that is intended for use as an in-depth tool for daily cytometer QC, and is appropriate for use with all lasers and detectors. It may be used to determine detection thresholds, understand resolution, and assess and track linearity of detectors. It can aid in providing confidence that the system is suitable for use, or alert operators to potential problems before samples are run. Quantum™ QC may also be used for instrument set-up to achieve standardized PMT settings and define the window of analysis for relevant detectors. Quantum™ QC is comprised of a blank and 7 (mixed) intensity populations. Quantum QC is used with a QuickCal-Linearity template that is downloaded from our website with an Access Code provided with the product at the time of shipping. Technical Data Sheet #PDS #725 & 725A



Catalog # Size

BLI725-5 5 ml

Ultra Rainbow Fluorescent Particles adm

Ultra Rainbow Fluorescent Particles are internally labeled with a mixture of fluorophores that enables them to be excited at wavelengths from 365nm to 650nm. Technical Data Sheet #PDS 612

Nom. Dia.	Tests	Catalog #	Size
~3.8µm	20	BLI610A-1	1 ml
~3.8µm	100	BLI610B-5	5 ml
~3.8µm	280	BLI610C-14	14 ml
~10.2µm	20	BLI611A-1	1 ml
~10.2µm	100	BLI611B-5	5 ml
~10.2µm	280	BLI611C-14	14 ml

Compensation

FITC / PE Compensation Standard adm

The FITC / PE Compensation Standard is a convenient means of setting two color compensation on a flow cytometer. Each kit contains an Autofluor™ bead, as well as a bead labeled with FITC, a bead labeled with PE, and one labeled with both FITC and PE. Technical Data Sheet #PDS 820

Tests	Catalog #	Size
20	BLI820A-1	1 ml
100	BLI820B-5	5 ml
280	BLI820C-14	14 ml

Simply Cellular® Compensation Standards adm

The Simply Cellular® Compensation Standard is a mixture of two Simply Cellular® antibody coated particle populations capable of binding high and low levels of the monoclonal antibody used in your assay. Ideal for performing compensation in multicolor (2, 3, 4 or more) analysis. Kits are specific for mouse, rat or human monoclonal antibodies. Technical Data Sheets #PDS 850, #PDS 851 and #PDS 852

Tests	Catalog #	Size
100	BLI550-5	5 ml
100	BLI552-5	5 ml
100	BLI551-5	5 ml

anti-Mouse IgG

anti-Human IgG

anti-Rat IgG



Microspheres & Particles

Instrument Standards

Simply Cellular® anti-Mouse for Violet Laser

The Simply Cellular® anti-Mouse for Violet Laser standard features microspheres comprised of a proprietary matrix that exhibits low autofluorescence with violet excitation. Beads are suitable for labeling with mouse antibodies conjugated with violet fluorochromes, and for use as a compensation or general reference standard for detectors off of the violet laser. Beads are also suitable for use with other fluorochromes / detectors, e.g. 488nm, 633nm. The Simply Cellular® anti-Mouse for Violet Laser standard is supplied as 2 populations: 1 blank and 1 high-binding anti-Mouse IgG (Fc specific) population. Supplied in an aqueous suspension containing ProClin®. Technical Data Sheet #PDS 835

Tests

20

100

Catalog

Size

BLI835A-1

1 ml

BLI835B-5

5 ml

Flow Cytometry Protein A Antibody Binding Beads *adm*

Single population Protein A microspheres are suitable for labeling with conjugated antibodies from a range of hosts. Labeled microspheres may be used as single-population reference standards or in conjunction with an unlabeled population for compensation purposes. Technical Data Sheet #PDS 853

BLI553-1

1 ml

BLI553-5

5 ml

BLI553-14

14 ml

Flow Cytometry Protein G Antibody Binding Beads *adm*

Single population Protein G microspheres are suitable for labeling with conjugated antibodies from a range of hosts. Labeled microspheres may be used as single-population reference standards or in conjunction with an unlabeled population for compensation purposes. Technical Data Sheet #PDS 854

BLI554-1

1 ml

BLI554-5

5 ml

BLI554-14

14 ml

Viability Dye Compensation Standard *adm*

Viability Dye Compensation Standards are suitable for labeling with LIVE / DEAD® stains or similarly reactive dyes to generate compensation standards for flow cytometric analyses. Beads are not suitable for labeling with DNA stains such as propidium iodide, DAPI, or Sytox®, and users should contact Technical Service for discussion if uncertain as to the compatibility of a specific dye or stain. Technical Data Sheet #PDS 853

Nom. Dia.

4µm

8µm

BLI450-3

3 ml

BLI451-3

3 ml

Fluorescence Reference

Flow Check™ YG Kit 2.0 *A2dm*

The particles in this kit allow comparison of various levels of green fluorescence. The kit contains 4 components packaged with ~1x10⁷ particles/ml: a full intensity bead, two intermediate intensity beads and a blank bead. The CV's of these particles offer excellent size and fluorescent CV control of all our microspheres. Technical Data Sheet #508

23513-1

1 kit

Components

Flow Check™ Yellow Green (YG) 2.0 High Intensity Alignment Grade

23518-10

10 ml

Flow Check™ Yellow Green (YG) Low Intensity Level 1

23524-10

10 ml

Flow Check™ Yellow Green (YG) Low Intensity Level 2

23525-10

10 ml

Flow Check™ Yellow Green (YG) Unlabeled

23526-10

10 ml

Flow Check™ YG Kit 6.0 *A2dm*

The particles in this kit allow comparison of various levels of green fluorescence.

Kit Contains: 4 components, each packaged with ~2 x 10⁶ particles/ml: a full intensity bead, two intermediate intensity beads and a blank bead. Technical Data Sheet #508

23512-1

1 kit

Components

Flow Check™ Yellow Green (YG) 6.0 High Intensity Alignment Grade

23519-10

10 ml

Flow Check™ Yellow Green (YG) Low Intensity Level 1

23522-10

10 ml

Flow Check™ Yellow Green (YG) Low Intensity Level 2

23523-10

10 ml

Flow Check™ Yellow Green (YG) Unlabeled

23521-10

10 ml



Instrument Standards

Fluorescence Reference Standards *adm*

Fluorescence Reference Standards are labeled with specific fluorochromes so that they give rise to the same fluorescence spectra as cells labeled with the same fluorochromes. Fluorescence intensity is similar to biological samples. Technical Data Sheets #PDS 890 and #PDS 892

	Tests	Catalog #	Size
Acridine Orange	20	BLI897A-1	1 ml
	100	BLI897B-5	5 ml
	280	BLI897C-14	14 ml
Alexa Fluor® 488	20	BLI886A-1	1 ml
	100	BLI886B-5	5 ml
	280	BLI886C-14	14 ml
Alexa Fluor® 647	20	BLI887A-1	1 ml
	100	BLI887B-5	5 ml
	280	BLI887C-14	14 ml
Allophycocyanine (APC)	20	BLI901A-1	1 ml
	100	BLI901B-5	5 ml
	280	BLI901C-14	14 ml
APC-Cy™7	20	BLI914A-1	1 ml
	100	BLI914B-5	5 ml
	280	BLI914C-14	14 ml
Certified Blank™ (no label)	20	BLI890A-1	1 ml
	100	BLI890B-5	5 ml
	280	BLI890C-14	14 ml
Chlorophyll	20	BLI898A-1	1 ml
	100	BLI898B-5	5 ml
	280	BLI898C-14	14 ml
Cy™5	20	BLI895A-1	1 ml
	100	BLI895B-5	5 ml
	280	BLI895C-14	14 ml
DAPI	20	BLI906A-1	1 ml
	100	BLI906B-5	5 ml
	280	BLI906C-14	14 ml
Far Out Red	20	BLI913A-1	1 ml
	100	BLI913B-5	5 ml
	280	BLI913C-14	14 ml
Fluorescein	20	BLI891A-1	1 ml
	100	BLI891B-5	5 ml
	280	BLI891C-14	14 ml
Hoechst 33342	20	BLI894A-1	1 ml
	100	BLI894B-5	5 ml
	280	BLI894C-14	14 ml
Pacific Blue™	20	BLI916A-1	1 ml
	100	BLI916B-5	5 ml
	280	BLI916C-14	14 ml
PE-Cy™5	20	BLI908A-1	1 ml
	100	BLI908B-5	5 ml



Microspheres & Particles

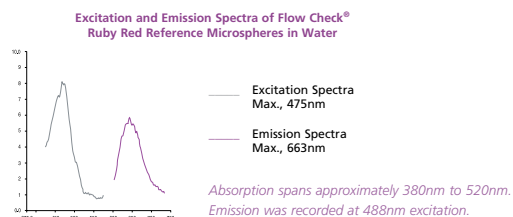
Instrument Standards

Fluorescence Reference Standards, cont.

	Tests	Catalog #	Size
PE-Cy™7	280	BLI908C-14	14 ml
	20	BLI889A-1	1 ml
	100	BLI889B-5	5 ml
PE-TR	280	BLI889C-14	14 ml
	20	BLI909A-1	1 ml
	100	BLI909B-5	5 ml
Propidium Iodide	280	BLI909C-14	14 ml
	20	BLI892A-1	1 ml
	100	BLI892B-5	5 ml
R-Phycoerythrin	280	BLI892C-14	14 ml
	20	BLI899A-1	1 ml
	100	BLI899B-5	5 ml
T.M. Rhodamine	280	BLI899C-14	14 ml
	20	BLI905A-1	1 ml
	100	BLI905B-5	5 ml
Texas Red®	280	BLI905C-14	14 ml
	20	BLI893A-1	1 ml
	100	BLI893B-5	5 ml
Violet Laser	280	BLI893C-14	14 ml
	20	BLI915A-1	1 ml
	100	BLI915B-5	5 ml
	280	BLI915C-14	14 ml

Flow Check™ Ruby Red Fluorescent Microspheres A2dm

Flow Check™ Ruby Red Fluorescent Microspheres are ~6µm narrow distribution polystyrene particles that can be used for flow cytometry applications where fluorescence emission in the range of 600nm to 710nm is needed. Suitable for 488nm and 663nm excitation with detection in PE-Cy™5 or APC channels. Supplied as a 5ml suspension (~5 x 10⁶ beads/ml) in a convenient dropper bottle. Ex. max: 475nm; Em. max: 663nm. Technical Data Sheet #624



24288-5 5 ml

Fluorescence Quantitation

Simply Cellular® dm

Antibody Binding Standards are particles that have ligands covalently linked to their surfaces to bind specific antibodies (e.g. Mouse IgG antibodies) in calibrated quantities. Technical Data Sheets #PDS 810, #PDS 812 and #PDS 813

	Tests	Catalog #	Size
anti-Mouse IgG	20	BLI810A-1	1 ml
	100	BLI810B-5	5 ml
	280	BLI810C-14	14 ml



Instrument Standards

	Tests	Catalog #	Size
anti-Human IgG	20	BLI812A-1	1 ml
	100	BLI812B-5	5 ml
	280	BLI812C-14	14 ml
anti-Rat IgG	20	BLI813A-1	1 ml
	100	BLI813B-5	5 ml
	280	BLI813C-14	14 ml

Simply Cellular® Compensation Standards *adm*

The Simply Cellular® Compensation Standard is a mixture of two Simply Cellular® antibody coated particle populations capable of binding high and low levels of the monoclonal antibody used in your assay. Ideal for performing compensation in multicolor (2, 3, 4 or more) analysis. Kits are specific for mouse, rat or human monoclonal antibodies. Technical Data Sheet #PDS 850, #PDS 851 and #PDS 852

	Tests	Catalog #	Size
anti-Mouse IgG	100	BLI550-5	5 ml
anti-Human IgG	100	BLI552-5	5 ml
anti-Rat IgG	100	BLI551-5	5 ml

Quantum™ Simply Cellular® *dm*

Quantum™ Simply Cellular® Kits contain a mixture of microbeads that bind specific amounts of IgG antibodies. These standards are calibrated in terms of Antibody Binding Capacity (ABC) and can be used to construct calibration plots to determine the ABC of unknown samples and monitor instrument performance. Our FREE Flow Cytometry Data Analysis, QuickCal® is designed to work with all Quantum™ Simply Cellular® Kits (*access QuickCal® by visiting www.bangslabs.com/products/quickcal and entering the Access Number provided with your standards*). Technical Data Sheet #PDS 814

	Tests	Catalog #	Size
anti-Mouse IgG	20	BLI815A-1	1 ml
	100	BLI815B-5	5 ml
	280	BLI815C-14	14 ml
anti-Human IgG	20	BLI816A-1	1 ml
	100	BLI816B-5	5 ml
	280	BLI816C-14	14 ml
anti-Rat IgG	20	BLI817A-1	1 ml
	100	BLI817B-5	5 ml
	280	BLI817C-14	14 ml

Instrument Standards

Quantum™ MESF *adm*

Quantum™ MESF Kits consist of a series of reference microbead standards whose intensities have been calibrated in Molecules of Equivalent Soluble Fluorochrome (MESF) units. Our FREE Flow Cytometry Data Analysis template, QuickCal®, works with all Quantum™ MESF Kits (*access QuickCal® by visiting www.bangslabs.com/products/quickcal and entering the Access Number provided with your standards*). A test requires one drop (50µl, ~100,000 particles) of each particle suspension. Bangs Flow Cytometry Standards are 7 - 9µm in diameter (unless otherwise noted) to approximate the size of human lymphocytes. Technical Data Sheet #PDS 821

	Tests	Catalog #	Size
Alexa Fluor® 488 MESF	20	BLI488A-1	1 ml
	100	BLI488B-5	5 ml
	280	BLI488C-14	14 ml
FITC-5 MESF	20	BLI555A-1	1 ml
	100	BLI555B-5	5 ml
	280	BLI555C-14	14 ml
FITC-5 MESF (Premix)	20	BLI555PA-1	1 ml
	100	BLI555PB-5	5 ml
	280	BLI555PC-14	14 ml
R-PE MESF	20	BLI827A-1	1 ml
	100	BLI827B-5	5 ml
	280	BLI827C-14	14 ml
PE-Cy™5 MESF	20	BLI828A-1	1 ml
Cy™5 MESF	20	BLI822A-1	1 ml
	100	BLI822B-5	5 ml
	280	BLI822C-14	14 ml
Alexa Fluor® 647 MESF	20	BLI647A-1	1 ml
	100	BLI647B-5	5 ml
	280	BLI647C-14	14 ml
APC MESF	20	BLI823A-1	1 ml
	100	BLI823B-5	5 ml
	280	BLI823C-14	14 ml

QuickCal® v. 2.3 Data Analysis Program

QuickCal® constructs a calibration curve associating fluorescence channel values to standardized fluorescence intensity units. Additionally, the channel value corresponding to the kit's blank bead is converted to the appropriate standardized fluorescence intensity unit (MESF or ABC); this will be the instrument's detection threshold for the specific reporter and detector. *For instructions regarding QuickCal®, please see Technical Data Sheet #PDS 819.*



Instrument Standards

Flow Applications

Cell Cycle Analysis

Fluorescence Reference Standards *adm*

Fluorescence Reference Standards are labeled with specific fluorochromes so that they give rise to the same fluorescence spectra as cells labeled with the same fluorochromes. Fluorescence intensity is similar to biological samples. Technical Data Sheets #PDS 890 and #PDS 892

	Tests	Catalog #	Size
Acridine Orange	20	BLI897A-1	1 ml
	100	BLI897B-5	5 ml
	280	BLI897C-14	14 ml
DAPI	20	BLI906A-1	1 ml
	100	BLI906B-5	5 ml
	280	BLI906C-14	14 ml
Fluorescein	20	BLI891A-1	1 ml
	100	BLI891B-5	5 ml
	280	BLI891C-14	14 ml
Hoechst 33342	20	BLI894A-1	1 ml
	100	BLI894B-5	5 ml
	280	BLI894C-14	14 ml
Propidium Iodide	20	BLI892A-1	1 ml
	100	BLI892B-5	5 ml
	280	BLI892C-14	14 ml

Viability Dye Compensation Standard *adm*

Viability Dye Compensation Standards are suitable for labeling with LIVE / DEAD® stains or similarly reactive dyes to generate compensation standards for flow cytometric analyses. Beads are not suitable for labeling with DNA stains such as propidium iodide, DAPI, or Sytox®, and users should contact Technical Service for discussion if uncertain as to the compatibility of a specific dye or stain. Technical Data Sheet #PDS 853

	Nom. Dia.	Catalog #	Size
	4µm	BLI450-3	3 ml
	8µm	BLI451-3	3 ml

Cell Size Estimation

Size Calibration Standards Kit *dm*

The Size Calibration Standards Kit includes five highly uniform unlabeled microbead populations of different diameters (~4 - 11µm), which can be used to construct calibration plots for electronic volume and light scatter instrumentation. Technical Data Sheet #829

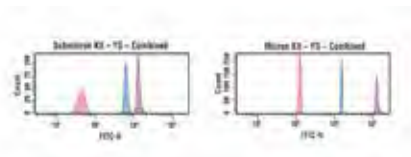
	Tests	Catalog #	Size
	100	BLI829B-5	5 ml
	280	BLI829C-14	14 ml



Instrument Standards

Small Bead Calibration Kits *A2adw*

Current applications in flow cytometry extend far beyond traditional lymphocyte immunophenotyping, with some applications involving the analysis of very small particles such as platelet- and endothelial-derived microparticles or microbial species. Our Small Bead Calibration Kits allow operators to verify the resolution capabilities of the flow cytometer, and to establish appropriate instrument settings for these analyses. Microspheres are dyed with Yellow Green (YG) and are suitable for use with FITC-optics. Technical Data Sheet #916



Submicron Bead Calibration Kit (0.2µm, 0.5µm, 0.8µm)

Particle Concentration

1 x 10⁸ particles/ml

Micron Bead Calibration Kit (1.0µm, 3.0µm, 6.0µm)

2 x 10⁶ particles/ml

Catalog # Size

BLI832-1 1 kit

BLI833-1 1 kit

Fluoresbrite® Calibration Grade Size Range Kit *A2dmw*

Our unique synthesis methods routinely result in particles with fluorescence CV's less than 5% and often as low as 1%. A range of 5 sizes of Fluoresbrite® YG microspheres can be used to calibrate the green channel.

Kit Contains: 1ml at 2.5% solids for each nominal size: 0.5µm, 1.0µm, 2.0µm, 3.0µm and 6.0µm.

18132-1 1 kit

Cell Counting

Flow Cytometry Absolute Count Standard™ *A2adm*

The Flow Cytometry Absolute Count Standard™ consists of highly uniform, cell-sized microspheres labeled with a full spectrum dye and provided at a known concentration (~1 x 10⁶). These beads fluoresce over a broad range of the spectrum, allowing them to be used as count standards in multiple detectors.

BLI580-10 10 ml

For additional count standards, please see our SureCount™ offerings on page 426.

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Technical Information

At Polysciences, we are committed to making the finest microspheres in the world, and providing the highest level of customer and technical service from initial discussions through the product lifecycle and beyond. We hope that you find this catalog to be helpful as you consider products for your work, and invite you to contact us if we may address any questions or be of assistance in formulating solutions to meet your specific needs.

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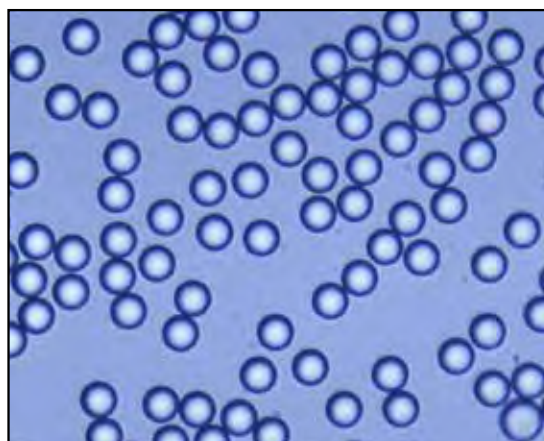
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Well-dispersed 10µm Polybead® Microspheres



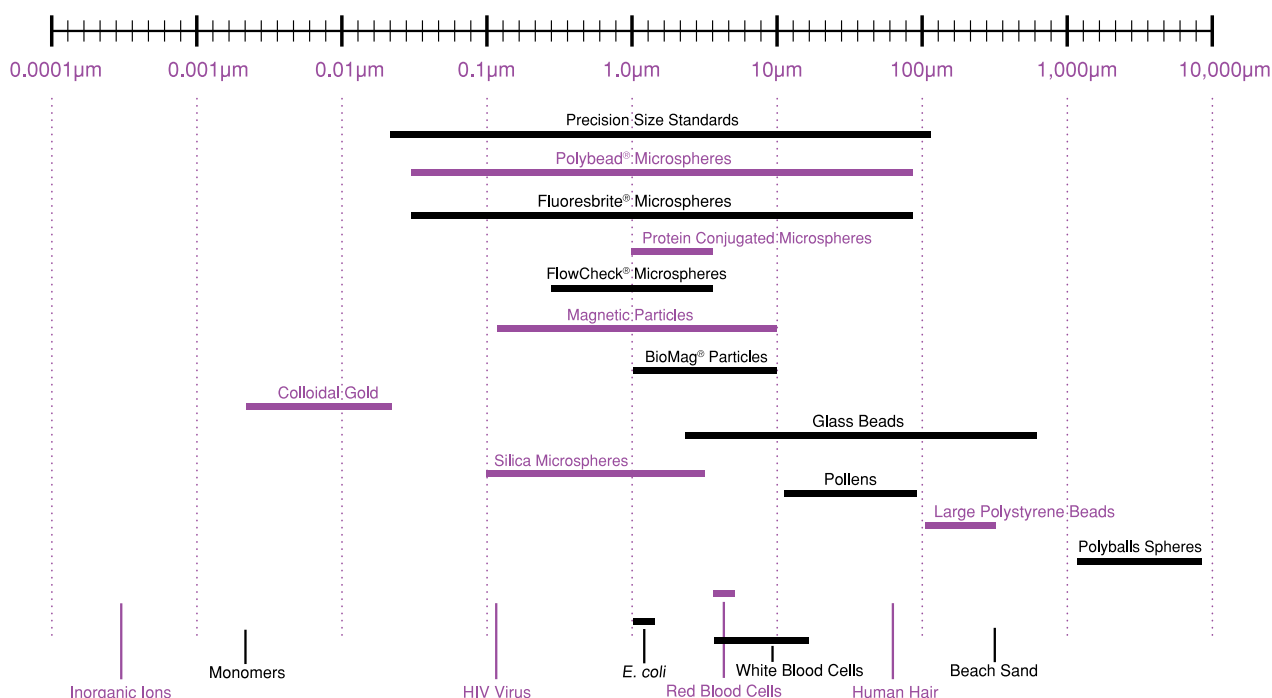
How Particles Measure Up

Precision Size Standards	0.04 - 175µm
Polybead® Microspheres	0.05 - 90µm
Fluoresbrite® Microspheres.....	0.05 - 90µm
Protein Conjugated Microspheres	1 - 6µm
Flow Check™ Microspheres	0.5 - 6.0µm
Magnetic Particles.....	0.2 - 10µm
BioMag® Particles.....	1.0 - 10µm
Colloidal Gold.....	0.005 - 0.06µm
Glass Beads	3 - 850µm
Silica Microspheres.....	0.1 - 5.0µm
Pollens.....	12 - 90µm

Large Polystyrene Beads.....	106 - 600µm
Polyballs.....	1,587.5 - 9,525µm
Inorganic Ions.....	0.0006µm
Monomers.....	0.0045µm
HIV virus.....	0.12µm
<i>E. coli</i>	1 - 2µm
Red Blood Cells.....	6 - 8µm
White Blood Cells.....	7 - 25µm
Human Hair	80µm
Beach Sand	650µm

How Polysciences' Microspheres and Other Particles Measure Up

1 Micron (µm) = 1,000 Nanometers = 10,000 Angstroms



Microsphere Selection

Microspheres offer a highly convenient and flexible system for developing reagents for assays and bioseparations and for use as instrument standards. As there are many varieties of microspheres available, it is important to think about the demands of the application when selecting a microsphere. Physical and optical properties should be considered in the context of handling and detection, and thought should also be given to requirements for diameter and size distribution, composition, surface chemistry and any other needed properties.

Property	Considerations
Size	Diameter, Uniformity / distribution
Composition	Density, Refractive index, Hydrophobicity / -philicity, Nonspecific binding, Autofluorescence
Surface chemistry	Reactive groups, Level of functionalization, Charge
Special properties	Visible dye / fluorophore, Superparamagnetic

Particle Size

Microsphere size may be critical to the proper function of an assay, or it may be secondary to other characteristics. Considering traditional diagnostic methods, the test or assay format commonly dictates particle size, such as the use of very small spheres (~0.1 - 0.4µm) to ensure satisfactory wicking in lateral flow tests, or the use of larger, cell-sized spheres (~4 - 10µm) for bead-based flow cytometric assays.

In magnetic separations, particularly those involving capture and elution of target, the exact size of the magnetic particle may be unimportant provided that the particles are in some general size range and offer desired separation characteristics.

Diameter also determines surface area. Small-diameter spheres present more surface area per unit mass, while larger spheres present more surface area per bead. Size also effects ease of handling, process considerations (such as the method used for separations [centrifugation, dialysis, filtration]) and the amount of reagent needed for coating.

All sizes listed in this catalog are nominal. For most products, the mean diameter of your particles will be printed on the label with the standard deviation.

Particle Composition

Common microsphere compositions include polystyrene (PS), poly(methyl methacrylate) (PMMA) and silica. These materials possess different physical and optical properties, which may present advantages or limitations for different applications.

Polymer beads are generally hydrophobic, and as such, have high protein binding abilities. However, they often require the use of some surfactant (e.g. 0.01 - 0.1% Tween® 20 or SDS) in the storage buffer to ensure ease of handling. During synthesis, functional monomers may be co-polymerized with styrene or methyl methacrylate to develop beads with reactive surface groups. Functional groups may be used in covalent binding reactions and also aid in stabilizing the suspension.

Silica microspheres are inherently hydrophilic and negatively-charged. Consequently, aqueous silica suspensions rarely require the use of surfactants or other colloidal stabilizers. Carboxyl- and amine-functionalized silica spheres are available for use in common covalent coating protocols, and plain silica microspheres may be modified using a variety of silanes to generate functional groups or alter surface properties.

Composition	Refractive Index (589nm)	Density (g/cm ³)	Glass Transition Temperature (°C)
PS	1.59	1.05	95
PMMA	1.49	1.19	105
Silica	1.43 - 1.46*	2.0*	>>1000

**Determined using representative samples. Other values are as reported in the literature for bulk polymer or silica.*



Common Test and Assay Formats

Test / Assay Format	Bead Size	Bead Type	Coating Strategy	Detection Strategy
Flow cytometric (suspension array)	2 - 15µm	QuantumPlex™, QuantumPlex™M (encoded populations for multiplexing), Non-fluorescent (simplex or multiplex with different bead sizes)	Covalent, Streptavidin / biotin	Flow cytometer
Lateral Flow	0.1 - 0.4µm	Dyed (visible or fluorescent)	Covalent, Adsorption	Visual or automated reader (absorbance, fluorescence), Visual
Lateral Flow - Boulders in the Stream	0.1 - 0.4µm mobile phase, ~2 - 3µm capture phase	Dyed (visible) mobile phase, Undyed capture beads	Covalent, Adsorption	Visual
Dipstick	0.1 - 0.4µm	Dyed (visible)	Covalent, Adsorption	Visual
Latex Agglutination Tests (LATs)	0.2 - 1.0µm	Undyed, Visibly dyed	Covalent, Adsorption	Visual (may be microscope-assisted)
Turbidimetric (Automated LAT)	50nm - 500nm	Undyed	Covalent	Turbidimetry

Magnetic Assays

Assays	Suggested Products
Immunoassays	ProMag™, ProMag™ HP, ProMag™ HC or BioMag®
Hybridization-based assays	ProMag™ and ProMag™ HC

Magnetic Separations

Magnetic Separations	Suggested Products
Cells	BioMag® anti-CD marker or secondary antibody
Subcellular organelles	BioMag®
Immunoprecipitates	BioMag® secondary antibody
mRNA	BioMag® Oligo dT(20) or mRNA Purification System
Biotinylated oligonucleotide capture or binding	ProMag™ or BioMag® Streptavidin
Biopanning	ProMag™ or BioMag®
Glycoproteins	BioMag® Wheat Germ Agglutinin or BioMag® Concanavalin A

Special Properties

Many applications in the life sciences demand added properties such as fluorescence or a visible color, or iron oxide inclusions for magnetic separations. Polymer spheres (and some polymer-based magnetic spheres) are often internally dyed via organic solvent swelling and many standard products are available. Dye concentrations can be adjusted to produce beads with different intensities to meet special needs, such as QuantumPlex™ for multiplexed flow cytometric assays or our Dragon Green or Flash Red Intensity Standards, which support imaging applications and associated instrument QC. Many surface- or internally-labeled fluorescent beads are also available as specialized flow cytometry standards.

Various types of superparamagnetic microparticles are available, with different matrices, magnetite content, surface groups, etc. For new assays or applications, magnetic beads should be evaluated with application demands in mind.

General Handling

Particle Suspension

The number of particles per ml will vary with the specified weight to volume (w / v) concentration, diameter of the particle and density of particle composition. The number of particles per milliliter can be calculated using the following equation:

$$\frac{6x \cdot 10^{12} \cdot \rho_L}{\rho_s \cdot \pi \cdot z^3}$$

x = solids content (g/ml)
 ρ_s = density of solid sphere (g/cm³)
 z = diameter (μm)
 ρ_L = density of bead suspension (g/ml)
 $\rho_L = 100 \cdot \rho_s / [100 \times (1 - \rho_s) + (100 \cdot \rho_s)]$

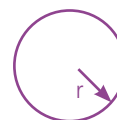
The following grid gives the estimated particles per milliliter for common diameters of polystyrene beads ($\rho = 1.05$ g/ml) suspended at 2.5% solids (w / v) and silica beads ($\rho = 2.0$ g/ml) suspended at 10% solids, at common diameters:

Diameter (μm)	Polystyrene 2.5% Solids (particles/ml)	Silica 10% Solids (particles/ml)
0.05	3.64×10^{14}	N/A
0.10	4.55×10^{13}	1.00×10^{13}
0.20	5.68×10^{13}	1.26×10^{13}
0.35	1.06×10^{12}	2.34×10^{12}
0.50	3.64×10^{11}	8.04×10^{11}
0.75	1.08×10^{11}	2.38×10^{11}
1.00	4.55×10^{10}	1.00×10^{10}
1.50	1.35×10^{10}	2.98×10^{10}
2.00	5.68×10^9	1.26×10^{10}
3.00	1.68×10^9	3.72×10^9

Diameter (μm)	Polystyrene 2.5% Solids (particles/ml)	Silica 10% Solids (particles/ml)
4.50	4.99×10^8	1.10×10^9
6.00	2.10×10^8	4.65×10^8
10.0	4.55×10^7	N/A
15.0	1.35×10^7	N/A
20.0	5.68×10^6	N/A
25.0	2.91×10^6	N/A
45.0	4.99×10^5	N/A
75.0	1.08×10^5	N/A
90.0	6.24×10^4	N/A

Surface to Volume Ratios

Use these formulas as a rough guide to estimate the surface area or the volume of a sphere. Determination of the surface area of polystyrene spheres is complicated by the unique form of the polymer. These beads are made by the formation of many single chain polymers which may be likened to a ball of wool. Thus, the surface area may be much greater than that predicted by the simple formula. This is particularly important for protein binding applications and charge calculations.



Surface Area = $4 \pi r^2$

Volume = $4 / 3 \pi r^3$

Handling and Storage

Our microspheres are synthesized in water and should be stored in aqueous environments. Deionized water is the best suspending medium for uncoated spheres as high concentrations of ions may result in aggregation. Coated microspheres should be stored in buffers that are appropriate for the ligand that is bound to the surface. Storage of particles over long periods of time should be at 4°C to deter the growth of microbes, and the particle suspensions must not be allowed to freeze. Dyed and fluorescent particles should be protected from light. Biocides may be added for extended storage.

Washing

Microspheres sold as instrument standards can often be used as-is, or simply diluted in an appropriate buffer or aqueous solution. Conversely, microspheres that will be coated or otherwise modified should be washed to remove additives and residuals that could interfere with the binding reactions or other processes.



Common washing and separation methods for non-magnetic beads include centrifugation, filtration and dialysis. Selection of the “best” method will depend on scale, required throughput and microsphere characteristics. Centrifugation is often used for small-scale separations of $\geq 0.5\mu\text{m}$, dialysis for spheres $< 0.5\mu\text{m}$ and filtration for small spheres $< 0.5\mu\text{m}$, or to achieve higher throughput. Superparamagnetic microparticles are separated using rare earth or electro-magnets.

Centrifugation

Particle washing may be conducted via centrifugation. This procedure must be performed carefully as excessive centrifugation may result in resuspension difficulties. Though centrifugation of BioMag® magnetic particles is not recommended, ProMag™ may be processed in this way. For the purposes of pelleting, it is important to understand the settling velocities of particles. For spherical particles, settling velocity can be calculated using Stokes’ Law:

$$V = \frac{2Ga^2(\rho_1 - \rho_2)}{9n}$$

V = Velocity (cm/sec)
 G = G force (1G = 980.7 cm/sec²)
 ρ_1 = density of particle (g/cm³)
 ρ_2 = density of suspending media (g/cm³)
 n = coefficient of viscosity (poise; g/cm-sec)
 a = radius of spherical particle in cm

For calculating the settling velocity of polystyrene spheres at 1 G in 20°C water, Stokes’ Law can be expressed in the following formula where d = diameter (μm) ($\rho_1 = 1.05 \text{ g/cm}^3$, $\rho_2 = 1.00 \text{ g/cm}^3$ and $n = 1.002 \text{ cp}$); $V = 2.77 \times 10^{-6} d^2$. To estimate appropriate times for centrifugation, settling velocity is multiplied by the G forces generated by the centrifuge. The resultant velocity is then compared to the height of the centrifuge tube.

For example:

A $1.0\mu\text{m}$ polystyrene particle placed in a microcentrifuge generating 10,000 G will settle at a velocity of $2.72 \times 10^{-2} \text{ cm/sec}$.

Pelleting the particle in a 4cm high tube would require a 144 second (minimum) centrifuge run. The actual time required to form an acceptable pellet could possibly be 50% longer. These calculations are intended to be used as guidelines to assist in determining centrifugation time. Different size particles yield dramatically different settling velocities. A $10.0\mu\text{m}$ particle could settle in 2 seconds under the aforementioned conditions, whereas a $0.01\mu\text{m}$ particle could take at least 4 hours to settle. Brownian motion and particle concentration also affect the settling rate.

Aggregation

Our microspheres are available in a variety of compositions, including polystyrene, poly(methyl methacrylate), and silica. Though polymer microspheres are more susceptible to hydrophobic-mediated aggregation, there are several factors that may influence the dispersity of the suspension. For example, low surface charge, small diameter (high surface area : volume ratio), high microsphere concentration and suboptimal buffer composition or pH may promote aggregation. Strategies that are effective in addressing aggregation thus counter these conditions, i.e. use of surfactant to reduce hydrophobicity (e.g. 0.01 - 0.1% Tween® 20 or SDS), sonication to disrupt aggregates and adjusting microsphere concentration or buffer pH to deter contact between individual spheres.

Coating Microspheres

General Information

Microspheres may be coated with capture molecules such as antibodies, oligonucleotides, peptides, etc. for use in diagnostic or separation applications. Microsphere coatings are typically optimized to achieve desired specific activity, while minimizing nonspecific interactions. Consideration should also be given to the required stability, development time frame and budget and the specific biomolecule to be coated. These factors will aid in determining the most fitting coating strategy for both short- and long-term objectives.

Standard microsphere products support three basic coating strategies: passive adsorption, covalent coupling and affinity binding. It is important to note that each binding strategy has benefits and limitations, which should be weighed in the context of study objectives and the demands that will be placed upon the finished reagent.

Passive Adsorption

Passive adsorption relies primarily on hydrophobic interactions between the biomolecule and the polymer particle. Such coatings are fairly simple to conduct, involving incubation of the microspheres with the purified ligand. They typically require little optimization and reagents may be developed relatively quickly. However, as adsorption relies on the formation of multiple attachment points between the molecule and the particle, this strategy is typically reserved for use with proteins and non-functionalized polymer spheres. Adsorption is generally not suitable for hormones, peptides or nucleic acids in hybridization-based applications, and protein adsorption to silica is expected to be less efficient than to polymer. Most techniques using passive adsorption technology report four to six months of bead stability. The reagent may be lyophilized for extended stability.

Covalent Coupling

Covalent coupling results in the permanent attachment of the molecule to the functionalized (e.g. carboxyl or amine) microsphere. It can provide needed stability when developing a commercial reagent, and for multiplexed assays, where analyte-specific bead populations are mixed. Additionally, specialized chemical linkers may be employed to address steric effects or to optimally orient the molecule. If surfactant is required as an additive in the assay, covalent coupling procedures are recommended as surfactants can displace adsorbed proteins from the surface. Covalent binding is also important for the immobilization of oligonucleotides or peptides, where end-point attachment is required. Although covalent binding protocols often involve a higher level of optimization than other approaches, coupling kits are available to simplify the process.

When Coupling to Particles Less Than 0.5µm

The chemical aspects of the protocols are universally applied, but the mechanical separations of these particles must be adapted for specific sizes. Most protocols suggest centrifugation to separate the particles from the reagents. This is not practical for particle sizes less than 0.5µm, as most microcentrifuges cannot spin these particles down within 30 minutes. Even extremely high G forces are not recommended, as resuspension becomes arduous. Other separation techniques may be utilized, such as dialysis, forced membrane filtration or centrifugal filter devices. Polysciences also offers coupling kits that use hollow fiber filtration techniques in addition to Vivaspin® Ultrafiltration devices to effect separation of 0.1-0.5µm particles.

Affinity Binding

Affinity binding is a straightforward method for immobilizing primary antibodies or tagged molecules. Proteins A and G and Fc-specific antibody coatings permit the directed immobilization of primary antibodies, and streptavidin (SA) is used extensively for the binding of biotinylated molecules, such as antibodies, peptides and oligonucleotides.

Biomolecule	Coating Strategy	Notes
Peptides	Covalent Streptavidin / biotin	End-point attachment to preserve the activity of the peptides.
Nucleic acids	Covalent Streptavidin / biotin	End-point attachment to permit hybridization of probe sequence with target sequence.
Proteins (e.g. antibodies)	Covalent Adsorption Streptavidin / biotin Proteins A / G	Common proteins are generally large enough that multi-point attachment and nonspecific orientation do not compromise their activity. However, linkers, spacers (covalent or SA / B) or affinity ligands may be employed to address steric effects or sub-optimal orientation.

Alternative for BSA as a Blocking Agent

Any innocuous protein may be used to block the effects of non-specific adsorption. In selecting an alternative to BSA, it is suggested that the size of the active protein and the size of the blocking protein be compared. BSA is highly recommended for IgG coupling. However, the large size of BSA could obscure the activity of smaller active proteins. Glycine or small polypeptides may be used as alternatives.

Protein Coupling Efficiency Determination

Coupling efficiency can be determined by measuring the change in absorbance of the supernatant before and after coupling.

1. Set spectrophotometer wavelength to 280nm. Blank with the Coupling Buffer.
2. Measure the absorbance of the Pre-Coupling Solution. A further dilution may be necessary to read an absorbance depending upon the amount of protein added (D = dilution factor).
3. Measure the absorbance of the Post-Coupling Solution. A dilution may be necessary to read the absorbance (D = dilution factor).
4. Calculate the coupling efficiency, expressed as the % Protein Uptake, as follows. Typical values of Protein Uptake are >60%.

$$\left[\frac{(A_{280} \text{ Pre-Coupling Solution}_1 \times D) - (A_{280} \text{ Post-Coupling Solution}_2 \times D)}{(A_{280} \text{ Pre-Coupling Solution}_1 \times D)} \times 100 \right]$$



Protein Binding Protocols

The following sequences serve as guidelines for protein binding. Technical Data Sheets (TDS) with detailed step-by-step protocols can be downloaded from our website, and ligand-specific immobilization protocols may be found in the literature.

Adsorbing Protein on Particles TDS #238E	Coupling by Carbodiimide TDS #238C & #644	Coupling by Glutaraldehyde TDS #238D & #238G
Plain Polystyrene <ul style="list-style-type: none"> Initial Buffer: 0.1M Borate Buffer, pH 8.5 Suspend in buffer, spin down and resuspend 2 or 3 times. Suspend in borate buffer. Add protein and mix end-to-end overnight. Spin and save supernatant for protein determination. Re-suspend in BSA in appropriate buffer and spin down twice. Re-suspend in PBS, pH 7.4, containing BSA (storage buffer). Protein bound directly on surface. 	Carboxylate Functional Particles <ul style="list-style-type: none"> Initial Buffer: 0.1M Carbonate Buffer Suspend in buffer, spin down and resuspend 2 or 3 times. Suspend in MES buffer. Add fresh carbodiimide solution dropwise and incubate for 15 - 30 minutes. Wash to remove excess carbodiimide, then resuspend in borate buffer. Add protein and mix end-to-end for 2 - 4 hours. Add ethanolamine, mix for 30 minutes. Spin and save supernatant for protein determination. Re-suspend in BSA-containing buffer and spin down twice. Re-suspend in PBS, pH 7.4, containing BSA (storage buffer). Protein bound 2 - 3 carbon atoms from surface. 	Amino or Blue Dyed Particles <ul style="list-style-type: none"> Initial Buffer: 0.02M PBS, pH 7.4 Suspend in buffer, spin down and resuspend 2 or 3 times. Suspend in PBS. Suspend in 8% glutaraldehyde in PBS, pH 7.4 and mix end-to-end for 4 - 6 hours. Wash to remove excess glutaraldehyde and resuspend in PBS buffer. Add protein and mix end-to-end overnight. Add ethanolamine, mix for 30 minutes. Spin and save supernatant for protein determination. Re-suspend in BSA-containing buffer and spin down twice. Re-suspend in PBS, pH 7.4, containing BSA (storage buffer). Protein bound 5 carbon atoms from surface of blue dyed beads and 11-12 carbon atoms from surface of amino beads.

Protein Coupling Troubleshooting

Below are some solutions for protein coupling troubleshooting. If you do not see a solution to the problem you have encountered, please email us at info@polysciences.com.

Problem	Solution
Clumping prior to use	Careful sonication
Clumping after procedure <ul style="list-style-type: none"> Carbodiimide addition causes clumping Glutaraldehyde addition causes clumping 	Isolate the step that causes clumping <ul style="list-style-type: none"> Add slowly, agitate beads, decrease bead concentration Add slowly, agitate beads, decrease bead concentration; add an excess of glutaraldehyde to avoid chemical crosslinking of particles; clumping will typically resolve by the conclusion of protein coupling Increase protein concentration Add surfactant or reduce number of washing steps
Low binding	Move pH closer to protein isoelectric point
Variable coating	Use pure water – no contaminants; use fresh reagents
Coating, but no reaction	Optimize pH away from isoelectric point
Centrifuge not practical	Use membrane filtration, dialysis, or spin filters for small particles
Nonspecific adsorption	Use an alternative for BSA (glycine, casein)
Small proteins bound, but not reactive	Use a crosslinking reagent to extend coupling away from the surface of the bead
Long-term storage leaches protein	Try covalent attachment or lyophilize final product

Polystyrene Microspheres

Polystyrene Microsphere General Characteristics

Parameter	Description
Size	0.05 - 150µm for a wide range of applications
Monodispersity	Coefficient of variance ≤15% for most size ranges, 0.05 - 90µm
Concentration	2.5%
Suspending medium	DI water with residual surfactant to ensure stable dispersions
Color	Undyed, red, yellow, black, blue, violet, orange, green and several fluorescent colors
Functionality	Plain, COOH, -NH ₂ and -OH.
Stability	Inert, safe for handling and ideal for biological studies
Protein Affinity	Covalent coupling for functionalized spheres or passive adsorption possible
Glass Transition	~94°C, stable to moderate heating temperature; some diameters feature a low level of DVB crosslinking
Bead Density	~1.05 g/cm ³ , similar to cell densities
Refractive Index (589nm)	~1.59 - 1.60, ideally suited for applications
Biocides	None (except where noted); particles are compatible with azide, ProClin® and other treatments.

Polystyrene Microsphere Stability

Polysciences offers a one year shelf life for most products. Unless noted, biocides are not added and the particles are shipped in DI water with residual surfactant. All polystyrene products should be stored at 4°C to prevent microbial growth. Microsphere suspensions must be protected from freezing to safeguard against irreversible aggregation. If long-term storage is required, the addition of biocide is recommended.

Polystyrene Microsphere Monodispersity

The following chart lists our specifications for the uniformity of our particles, expressed as the coefficient of variance (CV). The actual diameter (D) and the standard deviation (SD) for each lot is printed on the label. The % CV is expressed as the SD / D x 100.

Diameter (µm)	CV Maximum (%)
0.05	≤15
0.10	≤15
0.20	≤8
0.35	≤5
0.50	≤3

Diameter (µm)	CV Maximum (%)
0.75	≤3
1.00	≤3
1.5	≤5
2.00	≤5
3.00	≤5

Diameter (µm)	CV Maximum (%)
4.50	≤7
6.00	≤10
10.00	≤10
15.00 - 90.00	≤15

Polystyrene Microsphere Sterility and Shelf Life

Our polystyrene microspheres are packaged as non-sterile suspensions. We have made the decision to give the customer the option of adding biocides or preservatives into the product upon receipt. The particles will be stable for up to one year after the date of sale. Degradation of the particles, their functional groups or the incorporated dyes is not expected under normal conditions and our primary concern is the quality of the DI water. We make every effort to ensure that our water source and packaging procedures will allow us to meet our one year shelf life. If a sterile product is necessary, then the particles may be gamma irradiated. Additions of biocides, such as thimerosal or sodium azide, are common. For research applications involving *in vivo* studies or live cells, the particles can be suspended in alcohols prior to use. See Technical Data Sheet #670, *Decontaminating Microspheres*, for more information.



Embedding Tissues Containing Polystyrene Microspheres

Polystyrene microspheres have been visualized by light microscopy in unembedded coverslip monolayers, in fixed or unfixed frozen sections, in paraffin sections and in glycol methacrylate kits. For paraffin sections, n-butyl alcohol must be used for clearing and deparaffination since typical organic solvents (e.g. toluene, THF, or ethyl acetate) will destroy the beads. The beads cannot be embedded in methyl or butyl methacrylate media. TEM embedments in Epon and Spurr's have been successful.

Polybead® and Fluoresbrite® Dyed Particles

Types of Dyes Used

Our Fluoresbrite®, Polybead® and some Flow Check™ product feature water insoluble dyes*. This minimizes the incidence of dye leaching from the particles into aqueous buffers. Our visibly dyed microspheres are available as black, blue, red, violet, orange, green and yellow. Other colors and intensities are available on a custom basis. Many of the Bangs Flow Cytometry Standards are "surface dyed" with the same fluorochromes used for making antibody conjugates. Polysciences can custom manufacture Fluoresbrite® particles with a customer's dye of choice. Polysciences' most popular fluorescent dyes match the following filter settings:

Fluorescent Particles	Filter Setting	Dyed Particle	Excitation Max. (nm)	Emission Max. (nm)
BB (Bright Blue)	Coumarin	BB	360	407
YG (Yellow Green)	Fluorescein	YG	441	486
YO (Yellow Orange)*	Rhodamine	YO	529	546
PC (Polychromatic Red)	Phycoerythrin	PC	491; 512	554
		Ruby Red	475; 590	663
		FITC	492	512
		R-PE	480; 565	578
		Sulforhodamine	540	645
		APC	650	660

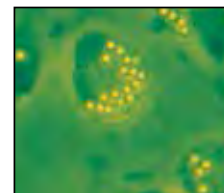
* YO has limited water solubility; some leaching may occur with rigorous washing.

Dyed Microspheres and Microscopy

A 6µm visibly dyed (non-fluorescent) particle is the smallest particle whose color can reasonably be observed under light microscopy conditions (400x). Infinite magnification of a dyed particle will result in an undyed appearance. Fluorescently-labeled Fluoresbrite® microspheres are recommended for microscopic viewing of particles smaller than 6µm. Fluoresbrite® 0.05µm particles have been identified using a fluorescent microscope set at 100x objective and 10x ocular magnification.

Fluoresbrite® for Phagocytosis or Retrograde Transport

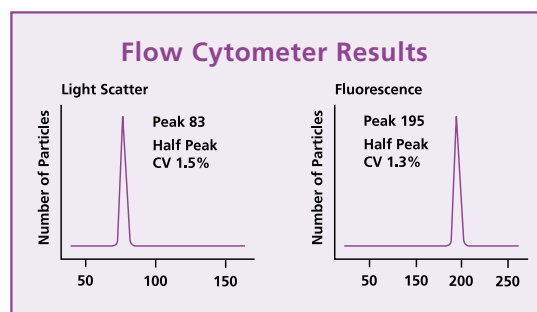
Uniform polystyrene particles are ideal for cellular studies. Microspheres are easily identified by their intense fluorescence, and polystyrene has long been recognized as a biologically active surface for cell attachment. See *Technical Data Sheet #430* for more information on phagocytosis studies.



Fluoresbrite® to Calibrate Flow Cytometers

Our Fluoresbrite® Calibration Grade particles have had a long history of use as flow cytometry standards. We also carry the extensive line of Bangs Flow Cytometry Standards. See *Technical Data Sheet #431* for more information.

Data for the chart to the right was obtained on a EPICS V instrument with fluorescent polystyrene beads, 2µm in diameter. Data courtesy of Kristi Harkins, University of Nebraska / Lincoln.



BioMag[®], BioMag[®]Plus and BioMag[®] Maxi

BioMag[®] Physical Characteristics

Our conventional BioMag[®] are irregularly-shaped iron oxide particles that are approximately 1-2 μ m in size. BioMag[®]Plus are similar, but have undergone additional processing for the reduction of outliers. BioMag[®] Maxi are ~6 μ m. Functionalized versions are covered with a silane coating that provides functional groups for the attachment of proteins or antibodies. The irregular shape of the BioMag[®], BioMag[®]Plus and BioMag[®] Maxi particles provide increased surface area and therefore increased binding capacity per unit mass.



BioMag [®] particle surface area:	>100 m ² /g
BioMag [®] particle density:	>>2.5 g/cc
BioMag [®] settling rate:	4% in 30 minutes

BioMag[®] Stability

As the BioMag[®] base particle is composed of coated iron oxide, the particle itself is very stable. However, any proteins or antibodies attached to BioMag[®] particles are susceptible to degradation over time. BioMag[®] should not be frozen or exposed to elevated temperatures.

BioMag[®] Stability in Solvents

BioMag[®] particles have been used in various coupling buffers at pH ranging from 5.5 to 8.0. Low pH buffers can be problematic for BioMag[®]. It is best to test BioMag[®] in advance of exposure to organic solvents or extreme pH conditions.

BioMag[®] Magnetic Responsiveness

BioMag[®] particles are superparamagnetic. In other words, they have no magnetic memory and will readily re-suspend if the magnetic force is removed. The particles are greater than 90% magnetite in composition and have a magnetization of 25 - 35 emu/g (Electromagnetic Units).



Positive and Negative Selection with BioMag[®]

BioMag[®] particles can be used for both positive and negative selections. In negative selection, the unwanted components are bound and pulled out of solution by the BioMag[®] particles. After magnetic separation, the resulting supernatant is enriched for the target cells or molecules. In positive selection schemes, the BioMag[®] particles are used to pull out of solution only the target cells or molecules of interest. Unwanted cell populations and other sample constituents will be discarded with the supernatant, resulting in a purified suspension of the target components.

Magnetic Separator for BioMag[®]

Small superparamagnetic particles such as BioMag[®] require a strong magnetic field for efficient separation. Polysciences' magnets offer optimal performance, featuring rare earth (Neodymium-Iron-Boron) magnets embedded in plastic housings, with magnetic strengths ranging from 27 - 35 megagauss Oersteds. See *Technical Data Sheet #796* for additional information on the magnetic separators offered.

For complete technical information for each BioMag[®] product, refer to the appropriate Technical Data Sheet.

Flow Cytometry Quality Control

Validation / Quality Control

An instrument validation / Quality Control (QC) program will depend on the type and complexity of the work being performed on the instrument. A multi-fluorescent bead such as Full Spectrum[™] allows operators to run a single product to check basic function and track general stability of all of the lasers / detectors. It will also be important to understand the sensitivity, resolution and linearity of different detectors. Linearity determinations are particularly important for quantitative fluorescence analyses.

Instrument Set-Up

Flow cytometers are highly configurable, and results can vary dramatically with different instrument settings. Establishing a common "Window of Analysis" for each detector with the upper and lower fluorescence limits defined, allows reference populations to be positioned in approximately the same place on the same scale. This may be accomplished with the aid of Quantum[™] QC or Full Spectrum[™]. If multi-color analyses are being performed, compensation standards will likely be required to tailor settings.



Applications

There are many different types of studies that can be conducted on a flow cytometer. This might include quantitative surface marker expression analysis (Quantum™ MESF, Quantum™ Simply Cellular®), absolute counting (Flow Cytometry Absolute Count Standard™), size estimation (Small Bead Calibration Kits, Size Calibration Standard Kits), or various fluorescence analysis (Fluorescence Reference Standards). For product-specific information, please see pages 348 - 362.

The chart that follows provides additional product recommendations for specific tasks / objectives, and we additionally invite you to contact us to discuss the specific requirements of your program.



Quantum™ APC MESF Kit

Category	Purpose	Frequency	Products
Daily QC	General check of instrument stability / status	Daily	Full Spectrum™ (multi) Ultra Rainbow Fluorescent Particles (multi) Fluorescence Reference Standards (single) Flow Check™ Ruby Red Fluorescent Microspheres (single) Quantum™ QC
Daily QC	General check of instrument optical system	Daily	Full Spectrum™ (multi) Ultra Rainbow Fluorescent Particles (multi) Fluorescence Reference Standards (single) Flow Check™ Ruby Red Fluorescent Microspheres (single) Quantum™ QC
Daily QC	Optical alignment	Daily	Right Reference Standard™ Flow Check™ Alignment and Compensation Particle Sets
Daily QC	Fluidics check	Daily	Surface-labeled fluorescent microspheres, e.g. Fluorescence Reference Standards, Quantum™ MESF
Weekly QC	Optical system sensitivity, resolution for linearity (for specific lasers / PMTs)	Weekly	Quantum™ QC
Daily Set-Up	Standardized instrument set-up (PMTs)	Daily or between runs if settings are changed	Quantum™ QC
Daily Set-Up	Standardized compensation settings for multi-color analyses	Daily or between runs if settings are changed	FITC/PE Compensation Standard Simply Cellular® Compensation Standard, Quantum™ Simply Cellular® Viability Dye Compensation Standard Simply Cellular® for Violet Laser
Application	Fluorescence quantitation in cellular expression studies or bead-based assays	Daily when quantitative analyses are performed or between different applications, if fluorescence PMT settings are changed	Quantum™ MESF Quantum™ Simply Cellular®
Application	F:P ratio determination for quantitative fluorescence analyses	As needed, i.e. with each new lot of fluorochrome-conjugated antibody	Simply Cellular® (used in conjunction with Quantum™ MESF)
Application	Compensation for multi-color flow cytometry	Daily or between different applications if fluorescence PMT settings are changed	FITC / PE Compensation Standard Simply Cellular® Compensation Standard Quantum™ Simply Cellular® Viability Dye Compensation Standard Simply Cellular® for Violet Laser, Fluorescence Reference Standards (single) Flow Cytometry Antibody Binding Beads (Protein A and G)
Application	Cell counting	As needed	Flow Cytometry Absolute Count Standard™
Application	Cell size estimation	As needed	Size Calibration Standards Kit Submicron Bead Calibration Kit Micron Bead Calibration Kit
Application	Suspension array	Platform for development of bead-based flow cytometric assays	QuantumPlex™ QuantumPlex™M

Technical Data Sheets

Accessory Reagents

- TDS #606 *MicroKros Hollow Fiber Filter*
- TDS #793 *Polysciences Bead Solution*
- TDS #794 *Polysciences Bead Coupling and Storage Buffers*
- TDS #911 *Accessory Reagents*
- TDS #912 *Surfactants*

Additional Microparticles

- TDS #281 *Sporopollenin Microparticles*
- TDS #604 *Iron Powder*
- TDS #605 *Black Iron Oxide Particles*
- TDS #607 *Red Iron Oxide Particles*
- TDS #744 *Hollow Glass Beads*
- TDS #758 *Glass Beads*
- TDS #783 *Phenolic Beads, Hollow*
- TDS #784 *Polybead® Hollow Microspheres*
- TDS #857 *Glass Beads*
- TDS #858 *PLGA Uniform Dry Microspheres*

Dyed Microspheres

- TDS #808 *Polybead® Dyed Microspheres*

Flow Cytometry Products

- TDS #508 *FlowCheck™ Microspheres*
- TDS #613 *FlowCheck™: Flow Cytometry Particles and Sets*
- TDS #624 *FlowCheck™ Ruby Red Fluorescent Microspheres*
- TDS #914 *Flow Cytometry Instrument Quality Assurance / Quality Control Program*
- TDS #916 *Small Bead Calibration Kits*
- TDS #PDS 214 *QuantumPlex™ SP Streptavidin*
- TDS #PDS 215 *QuantumPlex™ Streptavidin*
- TDS #PDS 234 *QuantumPlex™ SP Carboxyl*
- TDS #PDS 235 *QuantumPlex™ Carboxyl*
- TDS #PDS 250 *QuantumPlex™ M Carboxyl*
- TDS #PDS 251 *QuantumPlex™ M SP Carboxyl*
- TDS #PDS 252 *QuantumPlex™ M Streptavidin*
- TDS #PDS 253 *QuantumPlex™ M SP Streptavidin*
- TDS #PDS 510 *Right Reference Standard™*
- TDS #PDS 612 *Ultra Rainbow Fluorescent Particles*
- TDS #PDS 704 *Fluorescence Intensity Standards*
- TDS #PDS 725 *Quantum™ QC*
- TDS #PDS 810 *Simply Cellular® anti-Mouse IgG*
- TDS #PDS 812 *Simply Cellular® anti-Human IgG*
- TDS #PDS 813 *Simply Cellular® anti-Rat IgG*
- TDS #PDS 814 *Quantum™ Simply Cellular®*
- TDS #PDS 820 *FITC / PE Compensation Standard*
- TDS #PDS 821 *Quantum™ MESF Kits*
- TDS #PDS 829 *Size Calibration Standards Kit*
- TDS #PDS 831 *Time Delay Calibration Standard*
- TDS #PDS 835 *Simply Cellular® anti-Mouse for Violet Laser*
- TDS #PDS 850 *Simply Cellular® anti-Mouse Compensation Standard*
- TDS #PDS 851 *Simply Cellular® anti-Rat Compensation Standard*
- TDS #PDS 852 *Simply Cellular® anti-Human Compensation*

Standard

Flow Cytometry Products con't.

- TDS #PDS 853 *Viability Dye Compensation Standard*
- TDS #PDS 854 *Flow Cytometry Protein A and Protein G Antibody Binding Beads*
- TDS #PDS 880 *Flow Cytometry Absolute Count Standard™*
- TDS #PDS 885 *Full Spectrum™*
- TDS #PDS 890 *Fluorescence Reference Standards*
- TDS #PDS 892 *Alexa Fluor® Reference Standards*
- TDS #917 *Quantitative Cytometry*
- TDS #PDS 818 *Quantum™ Simply Cellular® and Quantum™ MESF Tips and Techniques*
- TDS #PDS 819 *QuickCal®, v 2.3 Data Analysis Program*

Fluorescent Microspheres

- TDS #431 *Fluoresbrite® Microparticles – Frequently Asked Questions*
- TDS #745 *Microsphere Excitation and Emission Spectra*
- TDS #913 *StarLight™ Calibration Slides*
- TDS #915 *Fluoresbrite® Europium Chelate Microspheres*

Informational Data Sheets

- TDS #410 *Microsphere Coating Reagents*
- TDS #430 *Phagocytosis and Microparticles*
- TDS #670 *Decontaminating Microspheres*
- TDS #753 *Streptavidin-Coated Microspheres Binding Biotinylated DNA*
- TDS #788 *Microsphere Selection*

Magnetic Microparticles

- TDS #438 *Magnetic Microparticles*
- TDS #528 *BioMag® and Cell Sorting*
- TDS #528A *BioMag® and Cell Sorting References*
- TDS #529 *BioMag® Oligo (dT) 20*
- TDS #530 *BioMag® Nuclease-free Streptavidin*
- TDS #531 *BioMag® Coupling Procedures for Attaching Oligonucleotides*
- TDS #546 *BioMag® Magnetic Immobilization Kit & BioMag® Amine*
- TDS #547 *BioMag® Superparamagnetic Iron Oxide*
- TDS #548 *BioMag® Goat anti-Rat IgG (Fc Specific)*
- TDS #549 *BioMag® Goat anti-Mouse IgG*
- TDS #550 *BioMag® Goat anti-Mouse IgG (Fc Specific)*
- TDS #551 *BioMag® Streptavidin*
- TDS #552 *BioMag® Biotin*
- TDS #553 *BioMag® Protein A*
- TDS #554 *BioMag® Protein G*
- TDS #555 *BioMag® Dextran-coated Charcoal*
- TDS #557 *BioMag® Goat anti-Rat IgM*
- TDS #558 *BioMag® Goat anti-Mouse IgM*
- TDS #559 *BioMag® Goat anti-Rabbit IgG*
- TDS #560 *BioMag® Goat anti-Rat IgG*
- TDS #561 *BioMag® Goat anti-Human IgM*
- TDS #562 *BioMag® Goat anti-Human IgG (Fc Specific)*
- TDS #563 *BioMag® Goat anti-Human IgG*
- TDS #569 *BioMag® SelectaPure mRNA Purification System*
- TDS #570 *BioMag® Carboxyl*



Magnetic Microparticles con't.

- TDS #580 BioMag® SelectaPure anti-Human CD3
- TDS #581 BioMag® SelectaPure anti-Human CD4
- TDS #583 BioMag® SelectaPure anti-Human CD8
- TDS #584 BioMag® SelectaPure anti-Human CD14
- TDS #585 BioMag® SelectaPure anti-Human CD16
- TDS #586 BioMag® SelectaPure anti-Human CD19
- TDS #587 BioMag® SelectaPure anti-Human CD34
- TDS #588 BioMag® SelectaPure anti-Human CD45
- TDS #589 BioMag® SelectaPure anti-Human CD56
- TDS #590 BioMag® SelectaPure anti-Human CD71
- TDS #591 Cell Sorting Using BioMag® SelectaPure anti-Human Leukocyte Particles
- TDS #592 BioMag® SelectaPure anti-Mouse CD4
- TDS #593 BioMag® SelectaPure anti-Mouse CD8a
- TDS #594 BioMag® SelectaPure anti-Mouse CD45R
- TDS #595 BioMag® SelectaPure anti-Human CD2
- TDS #596 BioMag® SelectaPure anti-Human CD11b
- TDS #597 BioMag® SelectaPure Human T cell Enrichment System
- TDS #617 BioMag®Plus Amine & BioMag®Plus Amine Protein Coupling Kit
- TDS #618 BioMag®Plus Carboxyl & BioMag®Plus Carboxyl Protein Coupling Kit
- TDS #619 BioMag®Plus Goat anti-Mouse IgG Particle Antibody Coupling Starter Kit
- TDS #620 BioMag®Plus Protein A and G Particle Antibody Isolation Starter Kit
- TDS #621 BioMag®Plus Streptavidin & BioMag®Plus Streptavidin / Biotin Binding Starter Kit
- TDS #658 ProMax Albumin Removal Kit
- TDS #659 ProMax Serum IgG Removal Kit
- TDS #692 BioMag®Plus Mouse anti-Fluorescein IgG
- TDS #721 BioMag® Maxi Carboxyl
- TDS #722 BioMag® Maxi Amine
- TDS #745 ProMag™ HC High Capacity Magnetic Microspheres
- TDS #755 ProMag™ Magnetic Microspheres
- TDS #759 BioMag®Plus Wheat Germ Agglutinin
- TDS #766 BioMag®Plus Concanavalin A
- TDS #855 Magnetic Particles – ProMag™ and BioMag®
- TDS #1003 ProMag™ High Performance Magnetic Microspheres

Magnetic Separators

- TDS #571 BioMag® Flask Separator
- TDS #572 BioMag® 15ml / 50ml Tube Separator
- TDS #573 BioMag® 12mm x 75mm Test Tube Separator
- TDS #574 BioMag® Multi-32 Microcentrifuge Tube Separator
- TDS #575 BioMag® 96-Well Plate Separator
- TDS #575A BioMag® 96-Well Plate Side Pull Magnetic Separator
- TDS #576 BioMag® Multi-6 Microcentrifuge Tube Separator
- TDS #577 BioMag® Solo-Sep Microcentrifuge Tube Separator
- TDS #791 BioMag® MultiSep Magnetic Separator
- TDS #796 Biomagnetic Separators

NIST Traceable Particle Size Standards

- TDS #623 Precision Particles: NIST Traceable Size Standards

Polymer Microspheres

- TDS #238 Polybead® Polystyrene Microspheres: FAQ
- TDS #238C Covalent Coupling of Proteins to Carboxylated Polystyrene Microparticles by the "Carbodiimide" Method
- TDS #238D Covalent Coupling of Proteins to Amino & Blue Dyed Microspheres
- TDS #238E Protocol for Adsorbing Proteins on Polystyrene Microspheres
- TDS #238G Glutaraldehyde Kit for Amino & Blue Dyed Beads
- TDS #404 Polyballs
- TDS #644 PolyLink Protein Coupling Kit for COOH Microparticles
- TDS #788 Polybead® Microspheres
- TDS #853 PolyLink Protein Coupling Kit with Hollow Fiber Filtering System
- TDS #854 Glutaraldehyde Coupling Kit with Hollow Fiber Filtering System
- TDS #856 Polystyrene Beads, Large

Protein Coated Microspheres

- TDS #615 Protein Conjugated Microspheres
- TDS #616 Streptavidin & Biotin Conjugated Microspheres

SNARE™ DNA Purification Systems

- TDS #710 SNARE™ Whole Blood Genomic DNA Purification System
- TDS #710A SNARE™ Whole Blood Genomic DNA Purification 96-Well Microtiter Plate Protocol
- TDS #711 SNARE™ Plasmid DNA Purification System
- TDS #712 SNARE™ Plant Genomic DNA Purification System

SureCount™ Particle Count Standards

- TDS #852 SureCount™ Particle Count Standards

Uniform Silica Microspheres

- TDS #635 Uniform Silica Microspheres
- TDS #792 Silica Microspheres, Colloidal

ViaCheck™ Viability Instrument Standards

- TDS #729 ViaCheck™ 0% Viability Control
- TDS #729 ViaCheck™ 25% Viability Control
- TDS #729 ViaCheck™ 50% Viability Control
- TDS #729 ViaCheck™ 75% Viability Control
- TDS #729 ViaCheck™ 90% Viability Control
- TDS #729 ViaCheck™ 100% Viability Control
- TDS #734 ViaCheck™ Concentration Control (1 x 10⁶)
- TDS #734 ViaCheck™ Concentration Control (4 x 10⁶)
- TDS #734 ViaCheck™ Concentration Control (8 x 10⁶)



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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Technical Information

At Polysciences, we are committed to making the finest microspheres in the world, and providing the highest level of customer and technical service from initial discussions through the product lifecycle and beyond. We hope that you find this catalog to be helpful as you consider products for your work, and invite you to contact us if we may address any questions or be of assistance in formulating solutions to meet your specific needs.

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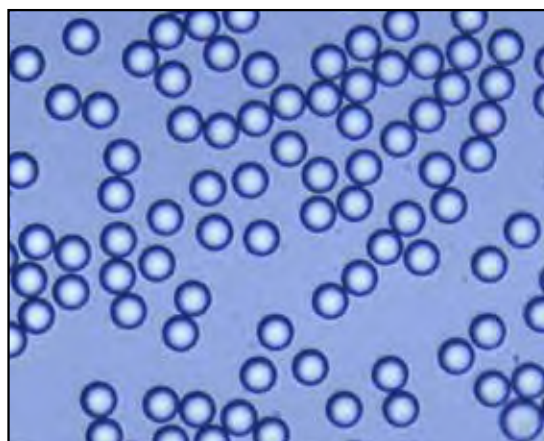
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Well-dispersed 10µm Polybead® Microspheres



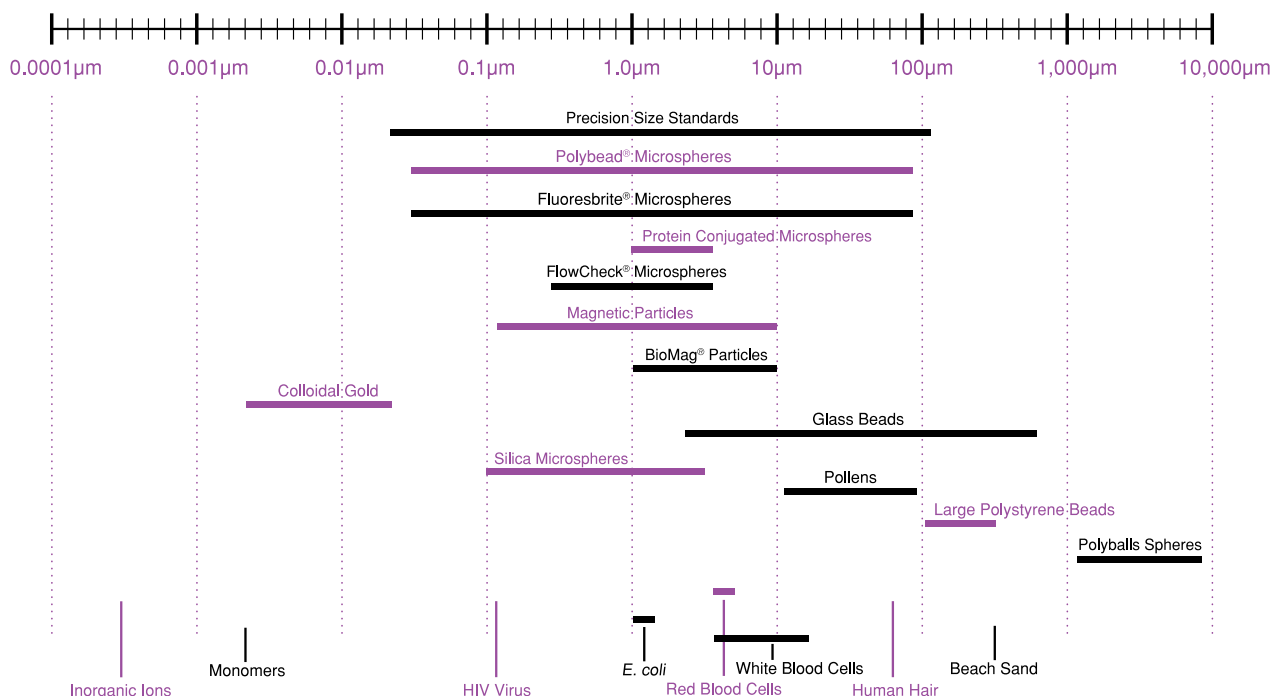
How Particles Measure Up

Precision Size Standards	0.04 - 175µm
Polybead® Microspheres	0.05 - 90µm
Fluoresbrite® Microspheres.....	0.05 - 90µm
Protein Conjugated Microspheres	1 - 6µm
Flow Check™ Microspheres	0.5 - 6.0µm
Magnetic Particles.....	0.2 - 10µm
BioMag® Particles.....	1.0 - 10µm
Colloidal Gold.....	0.005 - 0.06µm
Glass Beads	3 - 850µm
Silica Microspheres.....	0.1 - 5.0µm
Pollens.....	12 - 90µm

Large Polystyrene Beads.....	106 - 600µm
Polyballs.....	1,587.5 - 9,525µm
Inorganic Ions.....	0.0006µm
Monomers.....	0.0045µm
HIV virus.....	0.12µm
<i>E. coli</i>	1 - 2µm
Red Blood Cells.....	6 - 8µm
White Blood Cells.....	7 - 25µm
Human Hair	80µm
Beach Sand	650µm

How Polysciences' Microspheres and Other Particles Measure Up

1 Micron (µm) = 1,000 Nanometers = 10,000 Angstroms



Microsphere Selection

Microspheres offer a highly convenient and flexible system for developing reagents for assays and bioseparations and for use as instrument standards. As there are many varieties of microspheres available, it is important to think about the demands of the application when selecting a microsphere. Physical and optical properties should be considered in the context of handling and detection, and thought should also be given to requirements for diameter and size distribution, composition, surface chemistry and any other needed properties.

Property	Considerations
Size	Diameter, Uniformity / distribution
Composition	Density, Refractive index, Hydrophobicity / -philicity, Nonspecific binding, Autofluorescence
Surface chemistry	Reactive groups, Level of functionalization, Charge
Special properties	Visible dye / fluorophore, Superparamagnetic

Particle Size

Microsphere size may be critical to the proper function of an assay, or it may be secondary to other characteristics. Considering traditional diagnostic methods, the test or assay format commonly dictates particle size, such as the use of very small spheres (~0.1 - 0.4µm) to ensure satisfactory wicking in lateral flow tests, or the use of larger, cell-sized spheres (~4 - 10µm) for bead-based flow cytometric assays.

In magnetic separations, particularly those involving capture and elution of target, the exact size of the magnetic particle may be unimportant provided that the particles are in some general size range and offer desired separation characteristics.

Diameter also determines surface area. Small-diameter spheres present more surface area per unit mass, while larger spheres present more surface area per bead. Size also effects ease of handling, process considerations (such as the method used for separations [centrifugation, dialysis, filtration]) and the amount of reagent needed for coating.

All sizes listed in this catalog are nominal. For most products, the mean diameter of your particles will be printed on the label with the standard deviation.

Particle Composition

Common microsphere compositions include polystyrene (PS), poly(methyl methacrylate) (PMMA) and silica. These materials possess different physical and optical properties, which may present advantages or limitations for different applications.

Polymer beads are generally hydrophobic, and as such, have high protein binding abilities. However, they often require the use of some surfactant (e.g. 0.01 - 0.1% Tween® 20 or SDS) in the storage buffer to ensure ease of handling. During synthesis, functional monomers may be co-polymerized with styrene or methyl methacrylate to develop beads with reactive surface groups. Functional groups may be used in covalent binding reactions and also aid in stabilizing the suspension.

Silica microspheres are inherently hydrophilic and negatively-charged. Consequently, aqueous silica suspensions rarely require the use of surfactants or other colloidal stabilizers. Carboxyl- and amine-functionalized silica spheres are available for use in common covalent coating protocols, and plain silica microspheres may be modified using a variety of silanes to generate functional groups or alter surface properties.

Composition	Refractive Index (589nm)	Density (g/cm ³)	Glass Transition Temperature (°C)
PS	1.59	1.05	95
PMMA	1.49	1.19	105
Silica	1.43 - 1.46*	2.0*	>>1000

*Determined using representative samples. Other values are as reported in the literature for bulk polymer or silica.



Common Test and Assay Formats

Test / Assay Format	Bead Size	Bead Type	Coating Strategy	Detection Strategy
Flow cytometric (suspension array)	2 - 15µm	QuantumPlex™, QuantumPlex™M (encoded populations for multiplexing), Non-fluorescent (simplex or multiplex with different bead sizes)	Covalent, Streptavidin / biotin	Flow cytometer
Lateral Flow	0.1 - 0.4µm	Dyed (visible or fluorescent)	Covalent, Adsorption	Visual or automated reader (absorbance, fluorescence), Visual
Lateral Flow - Boulders in the Stream	0.1 - 0.4µm mobile phase, ~2 - 3µm capture phase	Dyed (visible) mobile phase, Undyed capture beads	Covalent, Adsorption	Visual
Dipstick	0.1 - 0.4µm	Dyed (visible)	Covalent, Adsorption	Visual
Latex Agglutination Tests (LATs)	0.2 - 1.0µm	Undyed, Visibly dyed	Covalent, Adsorption	Visual (may be microscope-assisted)
Turbidimetric (Automated LAT)	50nm - 500nm	Undyed	Covalent	Turbidimetry

Magnetic Assays

Assays	Suggested Products
Immunoassays	ProMag™, ProMag™ HP, ProMag™ HC or BioMag®
Hybridization-based assays	ProMag™ and ProMag™ HC

Magnetic Separations

Magnetic Separations	Suggested Products
Cells	BioMag® anti-CD marker or secondary antibody
Subcellular organelles	BioMag®
Immunoprecipitates	BioMag® secondary antibody
mRNA	BioMag® Oligo dT(20) or mRNA Purification System
Biotinylated oligonucleotide capture or binding	ProMag™ or BioMag® Streptavidin
Biopanning	ProMag™ or BioMag®
Glycoproteins	BioMag® Wheat Germ Agglutinin or BioMag® Concanavalin A

Special Properties

Many applications in the life sciences demand added properties such as fluorescence or a visible color, or iron oxide inclusions for magnetic separations. Polymer spheres (and some polymer-based magnetic spheres) are often internally dyed via organic solvent swelling and many standard products are available. Dye concentrations can be adjusted to produce beads with different intensities to meet special needs, such as QuantumPlex™ for multiplexed flow cytometric assays or our Dragon Green or Flash Red Intensity Standards, which support imaging applications and associated instrument QC. Many surface- or internally-labeled fluorescent beads are also available as specialized flow cytometry standards.

Various types of superparamagnetic microparticles are available, with different matrices, magnetite content, surface groups, etc. For new assays or applications, magnetic beads should be evaluated with application demands in mind.

General Handling

Particle Suspension

The number of particles per ml will vary with the specified weight to volume (w / v) concentration, diameter of the particle and density of particle composition. The number of particles per milliliter can be calculated using the following equation:

$$\frac{6x \cdot 10^{12} \cdot \rho_L}{\rho_s \cdot \pi \cdot z^3}$$

x = solids content (g/ml)
 ρ_s = density of solid sphere (g/cm³)
 z = diameter (μm)
 ρ_L = density of bead suspension (g/ml)
 $\rho_L = 100 \cdot \rho_s / [100 \times (1 - \rho_s) + (100 \cdot \rho_s)]$

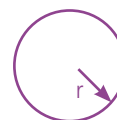
The following grid gives the estimated particles per milliliter for common diameters of polystyrene beads ($\rho = 1.05$ g/ml) suspended at 2.5% solids (w / v) and silica beads ($\rho = 2.0$ g/ml) suspended at 10% solids, at common diameters:

Diameter (μm)	Polystyrene 2.5% Solids (particles/ml)	Silica 10% Solids (particles/ml)
0.05	3.64×10^{14}	N/A
0.10	4.55×10^{13}	1.00×10^{13}
0.20	5.68×10^{13}	1.26×10^{13}
0.35	1.06×10^{12}	2.34×10^{12}
0.50	3.64×10^{11}	8.04×10^{11}
0.75	1.08×10^{11}	2.38×10^{11}
1.00	4.55×10^{10}	1.00×10^{10}
1.50	1.35×10^{10}	2.98×10^{10}
2.00	5.68×10^9	1.26×10^{10}
3.00	1.68×10^9	3.72×10^9

Diameter (μm)	Polystyrene 2.5% Solids (particles/ml)	Silica 10% Solids (particles/ml)
4.50	4.99×10^8	1.10×10^9
6.00	2.10×10^8	4.65×10^8
10.0	4.55×10^7	N/A
15.0	1.35×10^7	N/A
20.0	5.68×10^6	N/A
25.0	2.91×10^6	N/A
45.0	4.99×10^5	N/A
75.0	1.08×10^5	N/A
90.0	6.24×10^4	N/A

Surface to Volume Ratios

Use these formulas as a rough guide to estimate the surface area or the volume of a sphere. Determination of the surface area of polystyrene spheres is complicated by the unique form of the polymer. These beads are made by the formation of many single chain polymers which may be likened to a ball of wool. Thus, the surface area may be much greater than that predicted by the simple formula. This is particularly important for protein binding applications and charge calculations.



Surface Area = $4 \pi r^2$

Volume = $4 / 3 \pi r^3$

Handling and Storage

Our microspheres are synthesized in water and should be stored in aqueous environments. Deionized water is the best suspending medium for uncoated spheres as high concentrations of ions may result in aggregation. Coated microspheres should be stored in buffers that are appropriate for the ligand that is bound to the surface. Storage of particles over long periods of time should be at 4°C to deter the growth of microbes, and the particle suspensions must not be allowed to freeze. Dyed and fluorescent particles should be protected from light. Biocides may be added for extended storage.

Washing

Microspheres sold as instrument standards can often be used as-is, or simply diluted in an appropriate buffer or aqueous solution. Conversely, microspheres that will be coated or otherwise modified should be washed to remove additives and residuals that could interfere with the binding reactions or other processes.



Common washing and separation methods for non-magnetic beads include centrifugation, filtration and dialysis. Selection of the “best” method will depend on scale, required throughput and microsphere characteristics. Centrifugation is often used for small-scale separations of $\geq 0.5\mu\text{m}$, dialysis for spheres $< 0.5\mu\text{m}$ and filtration for small spheres $< 0.5\mu\text{m}$, or to achieve higher throughput. Superparamagnetic microparticles are separated using rare earth or electro-magnets.

Centrifugation

Particle washing may be conducted via centrifugation. This procedure must be performed carefully as excessive centrifugation may result in resuspension difficulties. Though centrifugation of BioMag® magnetic particles is not recommended, ProMag™ may be processed in this way. For the purposes of pelleting, it is important to understand the settling velocities of particles. For spherical particles, settling velocity can be calculated using Stokes’ Law:

$$V = \frac{2Ga^2(\rho_1 - \rho_2)}{9n}$$

V = Velocity (cm/sec)
 G = G force (1G = 980.7 cm/sec²)
 ρ_1 = density of particle (g/cm³)
 ρ_2 = density of suspending media (g/cm³)
 n = coefficient of viscosity (poise; g/cm-sec)
 a = radius of spherical particle in cm

For calculating the settling velocity of polystyrene spheres at 1 G in 20°C water, Stokes’ Law can be expressed in the following formula where d = diameter (μm) ($\rho_1 = 1.05 \text{ g/cm}^3$, $\rho_2 = 1.00 \text{ g/cm}^3$ and $n = 1.002 \text{ cp}$); $V = 2.77 \times 10^{-6} d^2$. To estimate appropriate times for centrifugation, settling velocity is multiplied by the G forces generated by the centrifuge. The resultant velocity is then compared to the height of the centrifuge tube.

For example:

A $1.0\mu\text{m}$ polystyrene particle placed in a microcentrifuge generating 10,000 G will settle at a velocity of $2.72 \times 10^{-2} \text{ cm/sec}$.

Pelleting the particle in a 4cm high tube would require a 144 second (minimum) centrifuge run. The actual time required to form an acceptable pellet could possibly be 50% longer. These calculations are intended to be used as guidelines to assist in determining centrifugation time. Different size particles yield dramatically different settling velocities. A $10.0\mu\text{m}$ particle could settle in 2 seconds under the aforementioned conditions, whereas a $0.01\mu\text{m}$ particle could take at least 4 hours to settle. Brownian motion and particle concentration also affect the settling rate.

Aggregation

Our microspheres are available in a variety of compositions, including polystyrene, poly(methyl methacrylate), and silica. Though polymer microspheres are more susceptible to hydrophobic-mediated aggregation, there are several factors that may influence the dispersity of the suspension. For example, low surface charge, small diameter (high surface area : volume ratio), high microsphere concentration and suboptimal buffer composition or pH may promote aggregation. Strategies that are effective in addressing aggregation thus counter these conditions, i.e. use of surfactant to reduce hydrophobicity (e.g. 0.01 - 0.1% Tween® 20 or SDS), sonication to disrupt aggregates and adjusting microsphere concentration or buffer pH to deter contact between individual spheres.

Coating Microspheres

General Information

Microspheres may be coated with capture molecules such as antibodies, oligonucleotides, peptides, etc. for use in diagnostic or separation applications. Microsphere coatings are typically optimized to achieve desired specific activity, while minimizing nonspecific interactions. Consideration should also be given to the required stability, development time frame and budget and the specific biomolecule to be coated. These factors will aid in determining the most fitting coating strategy for both short- and long-term objectives.

Standard microsphere products support three basic coating strategies: passive adsorption, covalent coupling and affinity binding. It is important to note that each binding strategy has benefits and limitations, which should be weighed in the context of study objectives and the demands that will be placed upon the finished reagent.

Passive Adsorption

Passive adsorption relies primarily on hydrophobic interactions between the biomolecule and the polymer particle. Such coatings are fairly simple to conduct, involving incubation of the microspheres with the purified ligand. They typically require little optimization and reagents may be developed relatively quickly. However, as adsorption relies on the formation of multiple attachment points between the molecule and the particle, this strategy is typically reserved for use with proteins and non-functionalized polymer spheres. Adsorption is generally not suitable for hormones, peptides or nucleic acids in hybridization-based applications, and protein adsorption to silica is expected to be less efficient than to polymer. Most techniques using passive adsorption technology report four to six months of bead stability. The reagent may be lyophilized for extended stability.

Covalent Coupling

Covalent coupling results in the permanent attachment of the molecule to the functionalized (e.g. carboxyl or amine) microsphere. It can provide needed stability when developing a commercial reagent, and for multiplexed assays, where analyte-specific bead populations are mixed. Additionally, specialized chemical linkers may be employed to address steric effects or to optimally orient the molecule. If surfactant is required as an additive in the assay, covalent coupling procedures are recommended as surfactants can displace adsorbed proteins from the surface. Covalent binding is also important for the immobilization of oligonucleotides or peptides, where end-point attachment is required. Although covalent binding protocols often involve a higher level of optimization than other approaches, coupling kits are available to simplify the process.

When Coupling to Particles Less Than 0.5µm

The chemical aspects of the protocols are universally applied, but the mechanical separations of these particles must be adapted for specific sizes. Most protocols suggest centrifugation to separate the particles from the reagents. This is not practical for particle sizes less than 0.5µm, as most microcentrifuges cannot spin these particles down within 30 minutes. Even extremely high G forces are not recommended, as resuspension becomes arduous. Other separation techniques may be utilized, such as dialysis, forced membrane filtration or centrifugal filter devices. Polysciences also offers coupling kits that use hollow fiber filtration techniques in addition to Vivaspin® Ultrafiltration devices to effect separation of 0.1-0.5µm particles.

Affinity Binding

Affinity binding is a straightforward method for immobilizing primary antibodies or tagged molecules. Proteins A and G and Fc-specific antibody coatings permit the directed immobilization of primary antibodies, and streptavidin (SA) is used extensively for the binding of biotinylated molecules, such as antibodies, peptides and oligonucleotides.

Biomolecule	Coating Strategy	Notes
Peptides	Covalent Streptavidin / biotin	End-point attachment to preserve the activity of the peptides.
Nucleic acids	Covalent Streptavidin / biotin	End-point attachment to permit hybridization of probe sequence with target sequence.
Proteins (e.g. antibodies)	Covalent Adsorption Streptavidin / biotin Proteins A / G	Common proteins are generally large enough that multi-point attachment and nonspecific orientation do not compromise their activity. However, linkers, spacers (covalent or SA / B) or affinity ligands may be employed to address steric effects or sub-optimal orientation.

Alternative for BSA as a Blocking Agent

Any innocuous protein may be used to block the effects of non-specific adsorption. In selecting an alternative to BSA, it is suggested that the size of the active protein and the size of the blocking protein be compared. BSA is highly recommended for IgG coupling. However, the large size of BSA could obscure the activity of smaller active proteins. Glycine or small polypeptides may be used as alternatives.

Protein Coupling Efficiency Determination

Coupling efficiency can be determined by measuring the change in absorbance of the supernatant before and after coupling.

1. Set spectrophotometer wavelength to 280nm. Blank with the Coupling Buffer.
2. Measure the absorbance of the Pre-Coupling Solution. A further dilution may be necessary to read an absorbance depending upon the amount of protein added (D = dilution factor).
3. Measure the absorbance of the Post-Coupling Solution. A dilution may be necessary to read the absorbance (D = dilution factor).
4. Calculate the coupling efficiency, expressed as the % Protein Uptake, as follows. Typical values of Protein Uptake are >60%.

$$\left[\frac{(A_{280} \text{ Pre-Coupling Solution}_1 \times D) - (A_{280} \text{ Post-Coupling Solution}_2 \times D)}{(A_{280} \text{ Pre-Coupling Solution}_1 \times D)} \times 100 \right]$$



Protein Binding Protocols

The following sequences serve as guidelines for protein binding. Technical Data Sheets (TDS) with detailed step-by-step protocols can be downloaded from our website, and ligand-specific immobilization protocols may be found in the literature.

Adsorbing Protein on Particles TDS #238E	Coupling by Carbodiimide TDS #238C & #644	Coupling by Glutaraldehyde TDS #238D & #238G
Plain Polystyrene <ul style="list-style-type: none"> Initial Buffer: 0.1M Borate Buffer, pH 8.5 Suspend in buffer, spin down and resuspend 2 or 3 times. Suspend in borate buffer. Add protein and mix end-to-end overnight. Spin and save supernatant for protein determination. Re-suspend in BSA in appropriate buffer and spin down twice. Re-suspend in PBS, pH 7.4, containing BSA (storage buffer). Protein bound directly on surface. 	Carboxylate Functional Particles <ul style="list-style-type: none"> Initial Buffer: 0.1M Carbonate Buffer Suspend in buffer, spin down and resuspend 2 or 3 times. Suspend in MES buffer. Add fresh carbodiimide solution dropwise and incubate for 15 - 30 minutes. Wash to remove excess carbodiimide, then resuspend in borate buffer. Add protein and mix end-to-end for 2 - 4 hours. Add ethanolamine, mix for 30 minutes. Spin and save supernatant for protein determination. Re-suspend in BSA-containing buffer and spin down twice. Re-suspend in PBS, pH 7.4, containing BSA (storage buffer). Protein bound 2 - 3 carbon atoms from surface. 	Amino or Blue Dyed Particles <ul style="list-style-type: none"> Initial Buffer: 0.02M PBS, pH 7.4 Suspend in buffer, spin down and resuspend 2 or 3 times. Suspend in PBS. Suspend in 8% glutaraldehyde in PBS, pH 7.4 and mix end-to-end for 4 - 6 hours. Wash to remove excess glutaraldehyde and resuspend in PBS buffer. Add protein and mix end-to-end overnight. Add ethanolamine, mix for 30 minutes. Spin and save supernatant for protein determination. Re-suspend in BSA-containing buffer and spin down twice. Re-suspend in PBS, pH 7.4, containing BSA (storage buffer). Protein bound 5 carbon atoms from surface of blue dyed beads and 11-12 carbon atoms from surface of amino beads.

Protein Coupling Troubleshooting

Below are some solutions for protein coupling troubleshooting. If you do not see a solution to the problem you have encountered, please email us at info@polysciences.com.

Problem	Solution
Clumping prior to use	Careful sonication
Clumping after procedure <ul style="list-style-type: none"> Carbodiimide addition causes clumping Glutaraldehyde addition causes clumping Protein addition causes clumping Washing causes clumping 	Isolate the step that causes clumping <ul style="list-style-type: none"> Add slowly, agitate beads, decrease bead concentration Add slowly, agitate beads, decrease bead concentration; add an excess of glutaraldehyde to avoid chemical crosslinking of particles; clumping will typically resolve by the conclusion of protein coupling Increase protein concentration Add surfactant or reduce number of washing steps
Low binding	Move pH closer to protein isoelectric point
Variable coating	Use pure water – no contaminants; use fresh reagents
Coating, but no reaction	Optimize pH away from isoelectric point
Centrifuge not practical	Use membrane filtration, dialysis, or spin filters for small particles
Nonspecific adsorption	Use an alternative for BSA (glycine, casein)
Small proteins bound, but not reactive	Use a crosslinking reagent to extend coupling away from the surface of the bead
Long-term storage leaches protein	Try covalent attachment or lyophilize final product

Polystyrene Microspheres

Polystyrene Microsphere General Characteristics

Parameter	Description
Size	0.05 - 150µm for a wide range of applications
Monodispersity	Coefficient of variance ≤15% for most size ranges, 0.05 - 90µm
Concentration	2.5%
Suspending medium	DI water with residual surfactant to ensure stable dispersions
Color	Undyed, red, yellow, black, blue, violet, orange, green and several fluorescent colors
Functionality	Plain, COOH, -NH ₂ and -OH.
Stability	Inert, safe for handling and ideal for biological studies
Protein Affinity	Covalent coupling for functionalized spheres or passive adsorption possible
Glass Transition	~94°C, stable to moderate heating temperature; some diameters feature a low level of DVB crosslinking
Bead Density	~1.05 g/cm ³ , similar to cell densities
Refractive Index (589nm)	~1.59 - 1.60, ideally suited for applications
Biocides	None (except where noted); particles are compatible with azide, ProClin® and other treatments.

Polystyrene Microsphere Stability

Polysciences offers a one year shelf life for most products. Unless noted, biocides are not added and the particles are shipped in DI water with residual surfactant. All polystyrene products should be stored at 4°C to prevent microbial growth. Microsphere suspensions must be protected from freezing to safeguard against irreversible aggregation. If long-term storage is required, the addition of biocide is recommended.

Polystyrene Microsphere Monodispersity

The following chart lists our specifications for the uniformity of our particles, expressed as the coefficient of variance (CV). The actual diameter (D) and the standard deviation (SD) for each lot is printed on the label. The % CV is expressed as the SD / D x 100.

Diameter (µm)	CV Maximum (%)
0.05	≤15
0.10	≤15
0.20	≤8
0.35	≤5
0.50	≤3

Diameter (µm)	CV Maximum (%)
0.75	≤3
1.00	≤3
1.5	≤5
2.00	≤5
3.00	≤5

Diameter (µm)	CV Maximum (%)
4.50	≤7
6.00	≤10
10.00	≤10
15.00 - 90.00	≤15

Polystyrene Microsphere Sterility and Shelf Life

Our polystyrene microspheres are packaged as non-sterile suspensions. We have made the decision to give the customer the option of adding biocides or preservatives into the product upon receipt. The particles will be stable for up to one year after the date of sale. Degradation of the particles, their functional groups or the incorporated dyes is not expected under normal conditions and our primary concern is the quality of the DI water. We make every effort to ensure that our water source and packaging procedures will allow us to meet our one year shelf life. If a sterile product is necessary, then the particles may be gamma irradiated. Additions of biocides, such as thimerosal or sodium azide, are common. For research applications involving *in vivo* studies or live cells, the particles can be suspended in alcohols prior to use. See Technical Data Sheet #670, *Decontaminating Microspheres*, for more information.



Embedding Tissues Containing Polystyrene Microspheres

Polystyrene microspheres have been visualized by light microscopy in unembedded coverslip monolayers, in fixed or unfixed frozen sections, in paraffin sections and in glycol methacrylate kits. For paraffin sections, n-butyl alcohol must be used for clearing and deparaffination since typical organic solvents (e.g. toluene, THF, or ethyl acetate) will destroy the beads. The beads cannot be embedded in methyl or butyl methacrylate media. TEM embedments in Epon and Spurr's have been successful.

Polybead® and Fluoresbrite® Dyed Particles

Types of Dyes Used

Our Fluoresbrite®, Polybead® and some Flow Check™ product feature water insoluble dyes*. This minimizes the incidence of dye leaching from the particles into aqueous buffers. Our visibly dyed microspheres are available as black, blue, red, violet, orange, green and yellow. Other colors and intensities are available on a custom basis. Many of the Bangs Flow Cytometry Standards are "surface dyed" with the same fluorochromes used for making antibody conjugates. Polysciences can custom manufacture Fluoresbrite® particles with a customer's dye of choice. Polysciences' most popular fluorescent dyes match the following filter settings:

Fluorescent Particles	Filter Setting	Dyed Particle	Excitation Max. (nm)	Emission Max. (nm)
BB (Bright Blue)	Coumarin	BB	360	407
YG (Yellow Green)	Fluorescein	YG	441	486
YO (Yellow Orange)*	Rhodamine	YO	529	546
PC (Polychromatic Red)	Phycoerythrin	PC	491; 512	554
		Ruby Red	475; 590	663
		FITC	492	512
		R-PE	480; 565	578
		Sulforhodamine	540	645
		APC	650	660

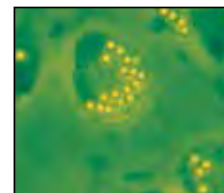
* YO has limited water solubility; some leaching may occur with rigorous washing.

Dyed Microspheres and Microscopy

A 6µm visibly dyed (non-fluorescent) particle is the smallest particle whose color can reasonably be observed under light microscopy conditions (400x). Infinite magnification of a dyed particle will result in an undyed appearance. Fluorescently-labeled Fluoresbrite® microspheres are recommended for microscopic viewing of particles smaller than 6µm. Fluoresbrite® 0.05µm particles have been identified using a fluorescent microscope set at 100x objective and 10x ocular magnification.

Fluoresbrite® for Phagocytosis or Retrograde Transport

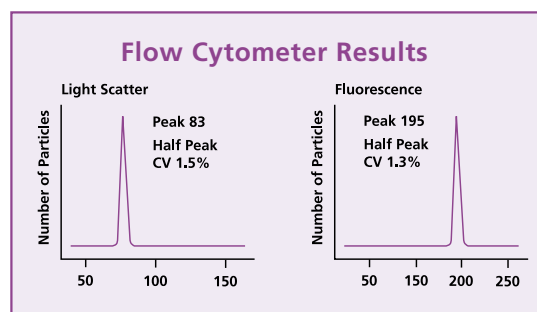
Uniform polystyrene particles are ideal for cellular studies. Microspheres are easily identified by their intense fluorescence, and polystyrene has long been recognized as a biologically active surface for cell attachment. See *Technical Data Sheet #430* for more information on phagocytosis studies.



Fluoresbrite® to Calibrate Flow Cytometers

Our Fluoresbrite® Calibration Grade particles have had a long history of use as flow cytometry standards. We also carry the extensive line of Bangs Flow Cytometry Standards. See *Technical Data Sheet #431* for more information.

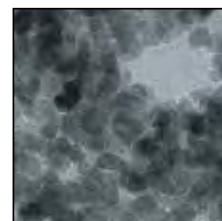
Data for the chart to the right was obtained on a EPICS V instrument with fluorescent polystyrene beads, 2µm in diameter. Data courtesy of Kristi Harkins, University of Nebraska / Lincoln.



BioMag®, BioMag®Plus and BioMag® Maxi

BioMag® Physical Characteristics

Our conventional BioMag® are irregularly-shaped iron oxide particles that are approximately 1-2µm in size. BioMag®Plus are similar, but have undergone additional processing for the reduction of outliers. BioMag® Maxi are ~6µm. Functionalized versions are covered with a silane coating that provides functional groups for the attachment of proteins or antibodies. The irregular shape of the BioMag®, BioMag®Plus and BioMag® Maxi particles provide increased surface area and therefore increased binding capacity per unit mass.



BioMag® particle surface area:	>100 m ² /g
BioMag® particle density:	>>2.5 g/cc
BioMag® settling rate:	4% in 30 minutes

BioMag® Stability

As the BioMag® base particle is composed of coated iron oxide, the particle itself is very stable. However, any proteins or antibodies attached to BioMag® particles are susceptible to degradation over time. BioMag® should not be frozen or exposed to elevated temperatures.

BioMag® Stability in Solvents

BioMag® particles have been used in various coupling buffers at pH ranging from 5.5 to 8.0. Low pH buffers can be problematic for BioMag®. It is best to test BioMag® in advance of exposure to organic solvents or extreme pH conditions.

BioMag® Magnetic Responsiveness

BioMag® particles are superparamagnetic. In other words, they have no magnetic memory and will readily re-suspend if the magnetic force is removed. The particles are greater than 90% magnetite in composition and have a magnetization of 25 - 35 emu/g (Electromagnetic Units).



Positive and Negative Selection with BioMag®

BioMag® particles can be used for both positive and negative selections. In negative selection, the unwanted components are bound and pulled out of solution by the BioMag® particles. After magnetic separation, the resulting supernatant is enriched for the target cells or molecules. In positive selection schemes, the BioMag® particles are used to pull out of solution only the target cells or molecules of interest. Unwanted cell populations and other sample constituents will be discarded with the supernatant, resulting in a purified suspension of the target components.

Magnetic Separator for BioMag®

Small superparamagnetic particles such as BioMag® require a strong magnetic field for efficient separation. Polysciences' magnets offer optimal performance, featuring rare earth (Neodymium-Iron-Boron) magnets embedded in plastic housings, with magnetic strengths ranging from 27 - 35 megagauss Oersteds. See *Technical Data Sheet #796* for additional information on the magnetic separators offered.

For complete technical information for each BioMag® product, refer to the appropriate Technical Data Sheet.

Flow Cytometry Quality Control

Validation / Quality Control

An instrument validation / Quality Control (QC) program will depend on the type and complexity of the work being performed on the instrument. A multi-fluorescent bead such as Full Spectrum™ allows operators to run a single product to check basic function and track general stability of all of the lasers / detectors. It will also be important to understand the sensitivity, resolution and linearity of different detectors. Linearity determinations are particularly important for quantitative fluorescence analyses.

Instrument Set-Up

Flow cytometers are highly configurable, and results can vary dramatically with different instrument settings. Establishing a common "Window of Analysis" for each detector with the upper and lower fluorescence limits defined, allows reference populations to be positioned in approximately the same place on the same scale. This may be accomplished with the aid of Quantum™ QC or Full Spectrum™. If multi-color analyses are being performed, compensation standards will likely be required to tailor settings.



Applications

There are many different types of studies that can be conducted on a flow cytometer. This might include quantitative surface marker expression analysis (Quantum™ MESF, Quantum™ Simply Cellular®), absolute counting (Flow Cytometry Absolute Count Standard™), size estimation (Small Bead Calibration Kits, Size Calibration Standard Kits), or various fluorescence analysis (Fluorescence Reference Standards). For product-specific information, please see pages 348 - 362.

The chart that follows provides additional product recommendations for specific tasks / objectives, and we additionally invite you to contact us to discuss the specific requirements of your program.



Quantum™ APC MESF Kit

Category	Purpose	Frequency	Products
Daily QC	General check of instrument stability / status	Daily	Full Spectrum™ (multi) Ultra Rainbow Fluorescent Particles (multi) Fluorescence Reference Standards (single) Flow Check™ Ruby Red Fluorescent Microspheres (single) Quantum™ QC
Daily QC	General check of instrument optical system	Daily	Full Spectrum™ (multi) Ultra Rainbow Fluorescent Particles (multi) Fluorescence Reference Standards (single) Flow Check™ Ruby Red Fluorescent Microspheres (single) Quantum™ QC
Daily QC	Optical alignment	Daily	Right Reference Standard™ Flow Check™ Alignment and Compensation Particle Sets
Daily QC	Fluidics check	Daily	Surface-labeled fluorescent microspheres, e.g. Fluorescence Reference Standards, Quantum™ MESF
Weekly QC	Optical system sensitivity, resolution for linearity (for specific lasers / PMTs)	Weekly	Quantum™ QC
Daily Set-Up	Standardized instrument set-up (PMTs)	Daily or between runs if settings are changed	Quantum™ QC
Daily Set-Up	Standardized compensation settings for multi-color analyses	Daily or between runs if settings are changed	FITC/PE Compensation Standard Simply Cellular® Compensation Standard, Quantum™ Simply Cellular® Viability Dye Compensation Standard Simply Cellular® for Violet Laser
Application	Fluorescence quantitation in cellular expression studies or bead-based assays	Daily when quantitative analyses are performed or between different applications, if fluorescence PMT settings are changed	Quantum™ MESF Quantum™ Simply Cellular®
Application	F:P ratio determination for quantitative fluorescence analyses	As needed, i.e. with each new lot of fluorochrome-conjugated antibody	Simply Cellular® (used in conjunction with Quantum™ MESF)
Application	Compensation for multi-color flow cytometry	Daily or between different applications if fluorescence PMT settings are changed	FITC / PE Compensation Standard Simply Cellular® Compensation Standard Quantum™ Simply Cellular® Viability Dye Compensation Standard Simply Cellular® for Violet Laser, Fluorescence Reference Standards (single) Flow Cytometry Antibody Binding Beads (Protein A and G)
Application	Cell counting	As needed	Flow Cytometry Absolute Count Standard™
Application	Cell size estimation	As needed	Size Calibration Standards Kit Submicron Bead Calibration Kit Micron Bead Calibration Kit
Application	Suspension array	Platform for development of bead-based flow cytometric assays	QuantumPlex™ QuantumPlex™M

Technical Data Sheets

Accessory Reagents

- TDS #606 *MicroKros Hollow Fiber Filter*
- TDS #793 *Polysciences Bead Solution*
- TDS #794 *Polysciences Bead Coupling and Storage Buffers*
- TDS #911 *Accessory Reagents*
- TDS #912 *Surfactants*

Additional Microparticles

- TDS #281 *Sporopollenin Microparticles*
- TDS #604 *Iron Powder*
- TDS #605 *Black Iron Oxide Particles*
- TDS #607 *Red Iron Oxide Particles*
- TDS #744 *Hollow Glass Beads*
- TDS #758 *Glass Beads*
- TDS #783 *Phenolic Beads, Hollow*
- TDS #784 *Polybead® Hollow Microspheres*
- TDS #857 *Glass Beads*
- TDS #858 *PLGA Uniform Dry Microspheres*

Dyed Microspheres

- TDS #808 *Polybead® Dyed Microspheres*

Flow Cytometry Products

- TDS #508 *FlowCheck™ Microspheres*
- TDS #613 *FlowCheck™: Flow Cytometry Particles and Sets*
- TDS #624 *FlowCheck™ Ruby Red Fluorescent Microspheres*
- TDS #914 *Flow Cytometry Instrument Quality Assurance / Quality Control Program*
- TDS #916 *Small Bead Calibration Kits*
- TDS #PDS 214 *QuantumPlex™ SP Streptavidin*
- TDS #PDS 215 *QuantumPlex™ Streptavidin*
- TDS #PDS 234 *QuantumPlex™ SP Carboxyl*
- TDS #PDS 235 *QuantumPlex™ Carboxyl*
- TDS #PDS 250 *QuantumPlex™ M Carboxyl*
- TDS #PDS 251 *QuantumPlex™ M SP Carboxyl*
- TDS #PDS 252 *QuantumPlex™ M Streptavidin*
- TDS #PDS 253 *QuantumPlex™ M SP Streptavidin*
- TDS #PDS 510 *Right Reference Standard™*
- TDS #PDS 612 *Ultra Rainbow Fluorescent Particles*
- TDS #PDS 704 *Fluorescence Intensity Standards*
- TDS #PDS 725 *Quantum™ QC*
- TDS #PDS 810 *Simply Cellular® anti-Mouse IgG*
- TDS #PDS 812 *Simply Cellular® anti-Human IgG*
- TDS #PDS 813 *Simply Cellular® anti-Rat IgG*
- TDS #PDS 814 *Quantum™ Simply Cellular®*
- TDS #PDS 820 *FITC / PE Compensation Standard*
- TDS #PDS 821 *Quantum™ MESF Kits*
- TDS #PDS 829 *Size Calibration Standards Kit*
- TDS #PDS 831 *Time Delay Calibration Standard*
- TDS #PDS 835 *Simply Cellular® anti-Mouse for Violet Laser*
- TDS #PDS 850 *Simply Cellular® anti-Mouse Compensation Standard*
- TDS #PDS 851 *Simply Cellular® anti-Rat Compensation Standard*
- TDS #PDS 852 *Simply Cellular® anti-Human Compensation*

Standard

Flow Cytometry Products con't.

- TDS #PDS 853 *Viability Dye Compensation Standard*
- TDS #PDS 854 *Flow Cytometry Protein A and Protein G Antibody Binding Beads*
- TDS #PDS 880 *Flow Cytometry Absolute Count Standard™*
- TDS #PDS 885 *Full Spectrum™*
- TDS #PDS 890 *Fluorescence Reference Standards*
- TDS #PDS 892 *Alexa Fluor® Reference Standards*
- TDS #917 *Quantitative Cytometry*
- TDS #PDS 818 *Quantum™ Simply Cellular® and Quantum™ MESF Tips and Techniques*
- TDS #PDS 819 *QuickCal®, v 2.3 Data Analysis Program*

Fluorescent Microspheres

- TDS #431 *Fluoresbrite® Microparticles – Frequently Asked Questions*
- TDS #745 *Microsphere Excitation and Emission Spectra*
- TDS #913 *StarLight™ Calibration Slides*
- TDS #915 *Fluoresbrite® Europium Chelate Microspheres*

Informational Data Sheets

- TDS #410 *Microsphere Coating Reagents*
- TDS #430 *Phagocytosis and Microparticles*
- TDS #670 *Decontaminating Microspheres*
- TDS #753 *Streptavidin-Coated Microspheres Binding Biotinylated DNA*
- TDS #788 *Microsphere Selection*

Magnetic Microparticles

- TDS #438 *Magnetic Microparticles*
- TDS #528 *BioMag® and Cell Sorting*
- TDS #528A *BioMag® and Cell Sorting References*
- TDS #529 *BioMag® Oligo (dT) 20*
- TDS #530 *BioMag® Nuclease-free Streptavidin*
- TDS #531 *BioMag® Coupling Procedures for Attaching Oligonucleotides*
- TDS #546 *BioMag® Magnetic Immobilization Kit & BioMag® Amine*
- TDS #547 *BioMag® Superparamagnetic Iron Oxide*
- TDS #548 *BioMag® Goat anti-Rat IgG (Fc Specific)*
- TDS #549 *BioMag® Goat anti-Mouse IgG*
- TDS #550 *BioMag® Goat anti-Mouse IgG (Fc Specific)*
- TDS #551 *BioMag® Streptavidin*
- TDS #552 *BioMag® Biotin*
- TDS #553 *BioMag® Protein A*
- TDS #554 *BioMag® Protein G*
- TDS #555 *BioMag® Dextran-coated Charcoal*
- TDS #557 *BioMag® Goat anti-Rat IgM*
- TDS #558 *BioMag® Goat anti-Mouse IgM*
- TDS #559 *BioMag® Goat anti-Rabbit IgG*
- TDS #560 *BioMag® Goat anti-Rat IgG*
- TDS #561 *BioMag® Goat anti-Human IgM*
- TDS #562 *BioMag® Goat anti-Human IgG (Fc Specific)*
- TDS #563 *BioMag® Goat anti-Human IgG*
- TDS #569 *BioMag® SelectaPure mRNA Purification System*
- TDS #570 *BioMag® Carboxyl*



Magnetic Microparticles con't.

- TDS #580 BioMag® SelectaPure anti-Human CD3
- TDS #581 BioMag® SelectaPure anti-Human CD4
- TDS #583 BioMag® SelectaPure anti-Human CD8
- TDS #584 BioMag® SelectaPure anti-Human CD14
- TDS #585 BioMag® SelectaPure anti-Human CD16
- TDS #586 BioMag® SelectaPure anti-Human CD19
- TDS #587 BioMag® SelectaPure anti-Human CD34
- TDS #588 BioMag® SelectaPure anti-Human CD45
- TDS #589 BioMag® SelectaPure anti-Human CD56
- TDS #590 BioMag® SelectaPure anti-Human CD71
- TDS #591 Cell Sorting Using BioMag® SelectaPure anti-Human Leukocyte Particles
- TDS #592 BioMag® SelectaPure anti-Mouse CD4
- TDS #593 BioMag® SelectaPure anti-Mouse CD8a
- TDS #594 BioMag® SelectaPure anti-Mouse CD45R
- TDS #595 BioMag® SelectaPure anti-Human CD2
- TDS #596 BioMag® SelectaPure anti-Human CD11b
- TDS #597 BioMag® SelectaPure Human T cell Enrichment System
- TDS #617 BioMag®Plus Amine & BioMag®Plus Amine Protein Coupling Kit
- TDS #618 BioMag®Plus Carboxyl & BioMag®Plus Carboxyl Protein Coupling Kit
- TDS #619 BioMag®Plus Goat anti-Mouse IgG Particle Antibody Coupling Starter Kit
- TDS #620 BioMag®Plus Protein A and G Particle Antibody Isolation Starter Kit
- TDS #621 BioMag®Plus Streptavidin & BioMag®Plus Streptavidin / Biotin Binding Starter Kit
- TDS #658 ProMax Albumin Removal Kit
- TDS #659 ProMax Serum IgG Removal Kit
- TDS #692 BioMag®Plus Mouse anti-Fluorescein IgG
- TDS #721 BioMag® Maxi Carboxyl
- TDS #722 BioMag® Maxi Amine
- TDS #745 ProMag™ HC High Capacity Magnetic Microspheres
- TDS #755 ProMag™ Magnetic Microspheres
- TDS #759 BioMag®Plus Wheat Germ Agglutinin
- TDS #766 BioMag®Plus Concanavalin A
- TDS #855 Magnetic Particles – ProMag™ and BioMag®
- TDS #1003 ProMag™ High Performance Magnetic Microspheres

Magnetic Separators

- TDS #571 BioMag® Flask Separator
- TDS #572 BioMag® 15ml / 50ml Tube Separator
- TDS #573 BioMag® 12mm x 75mm Test Tube Separator
- TDS #574 BioMag® Multi-32 Microcentrifuge Tube Separator
- TDS #575 BioMag® 96-Well Plate Separator
- TDS #575A BioMag® 96-Well Plate Side Pull Magnetic Separator
- TDS #576 BioMag® Multi-6 Microcentrifuge Tube Separator
- TDS #577 BioMag® Solo-Sep Microcentrifuge Tube Separator
- TDS #791 BioMag® MultiSep Magnetic Separator
- TDS #796 Biomagnetic Separators

NIST Traceable Particle Size Standards

- TDS #623 Precision Particles: NIST Traceable Size Standards

Polymer Microspheres

- TDS #238 Polybead® Polystyrene Microspheres: FAQ
- TDS #238C Covalent Coupling of Proteins to Carboxylated Polystyrene Microparticles by the "Carbodiimide" Method
- TDS #238D Covalent Coupling of Proteins to Amino & Blue Dyed Microspheres
- TDS #238E Protocol for Adsorbing Proteins on Polystyrene Microspheres
- TDS #238G Glutaraldehyde Kit for Amino & Blue Dyed Beads
- TDS #404 Polyballs
- TDS #644 PolyLink Protein Coupling Kit for COOH Microparticles
- TDS #788 Polybead® Microspheres
- TDS #853 PolyLink Protein Coupling Kit with Hollow Fiber Filtering System
- TDS #854 Glutaraldehyde Coupling Kit with Hollow Fiber Filtering System
- TDS #856 Polystyrene Beads, Large

Protein Coated Microspheres

- TDS #615 Protein Conjugated Microspheres
- TDS #616 Streptavidin & Biotin Conjugated Microspheres

SNARE™ DNA Purification Systems

- TDS #710 SNARE™ Whole Blood Genomic DNA Purification System
- TDS #710A SNARE™ Whole Blood Genomic DNA Purification 96-Well Microtiter Plate Protocol
- TDS #711 SNARE™ Plasmid DNA Purification System
- TDS #712 SNARE™ Plant Genomic DNA Purification System

SureCount™ Particle Count Standards

- TDS #852 SureCount™ Particle Count Standards

Uniform Silica Microspheres

- TDS #635 Uniform Silica Microspheres
- TDS #792 Silica Microspheres, Colloidal

ViaCheck™ Viability Instrument Standards

- TDS #729 ViaCheck™ 0% Viability Control
- TDS #729 ViaCheck™ 25% Viability Control
- TDS #729 ViaCheck™ 50% Viability Control
- TDS #729 ViaCheck™ 75% Viability Control
- TDS #729 ViaCheck™ 90% Viability Control
- TDS #729 ViaCheck™ 100% Viability Control
- TDS #734 ViaCheck™ Concentration Control (1 x 10⁶)
- TDS #734 ViaCheck™ Concentration Control (4 x 10⁶)
- TDS #734 ViaCheck™ Concentration Control (8 x 10⁶)



This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal grey lines across its entire width, providing a template for writing or drawing. The background is a clean, solid white color.

[illegible]



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[illegible]

