

## Particle Technology 2016 Product Catalog



Innovative particle solutions  
**Proven performance**

**Thermo**  
SCIENTIFIC

# Beads by Application

## Immunoassays

### Flow Cytometry / Multiplexing

- Cyto-Plex Multiplex Beads.....25

### Lateral Flow Tests

- Color-Rich Dyed Carboxylate-modified Beads.....28
- Fluoro-Max Europium Chelate Beads.....32
- Fluoro-Max Green, Red & Blue Fluorescent Beads.....34-35

### Slide Agglutination Tests

- Color-Rich Dyed Carboxylate-modified Beads.....28
- Opti-Link Carboxylate-modified Beads.....38
- Opti-Bind Sulfate Beads.....39

### Turbidimetric Assays

- Opti-Link Carboxylate-modified Beads.....38
- Opti-Bind Sulfate Beads.....39
- Power-Bind Beads.....39

## Standards / Quality Control

### Aerosols

- Dri-Cal Particle Size Standard Beads.....12
- 3K/4K Series Beads.....16

### Drinking Water / Filter Testing

- 2000 Series Duke Standards Uniform Beads.....6
- 3000 Series Nanosphere Size Beads.....7
- 4000 Series Duke Standards Monosized Beads.....8
- Dri-Cal Particle Size Standard Beads.....12
- Validex Count Precision Standards Beads.....17

### Flow Cytometry

- Cyto-Cal Multifluor + Violet Beads.....22
- Cyto-Cal Alignment Beads.....23
- Cyto-Cal Absolute Count Control Beads.....24

### Industrial (granules, powders, etc.) / Food / Ag

- 2000 Series Duke Standards Uniform Beads.....6
- 3000 Series Nanosphere Size Beads.....7
- 4000 Series Duke Standards Monosized Beads.....8
- 8000 Series Nanosphere Size Beads.....9
- 9000 Series Duke Standards Glass Beads.....9

### Particle Characterization

- 3000 Series Nanosphere Size Beads.....7
- 4000 Series Duke Standards Monosized Beads.....8
- 8000 Series Nanosphere Size Beads.....9
- 9000 Series Duke Standards Glass Beads.....9

## Pharmaceutical

- Chromosphere-T Certified Size Standard Beads.....10
- 4D Series Size Standard Beads.....13
- Ezy Cal Beads.....17
- Pharm-trol Beads.....18
- Count-Cal Beads.....19

## Research & Development / Filter Evaluation

- ChromoSphere Dyed (Dry) Beads.....29
- Fluoro-Max Green & Red Fluorescent Beads.....33
- 5000 Series Beads.....44
- 7000 Series Beads.....45

## Semiconductor

- Surf-Cal Beads.....11
- 4D Series Size Standard Beads.....13

## Smoke Detector and HEPA Filter Checks

- Smoke-Check Smoke Detector Challenge Beads.....43
- HEPA-Check Filter Challenge Beads.....43

## Wastewater

- Ezy-Cal Count Precision Standards Beads.....17
- Validex Count Precision Standards Beads.....17



# Beads by Product Line

## Size Standards (NIST Traceable)

- 2000 Series Duke Standards Uniform Beads.....6
- 3000 Series Nanosphere Size Beads.....7
- 4000 Series Duke Standards Monosized Beads.....8
- 8000 Series Nanosphere Size Beads.....9
- 9000 Series Duke Standards Glass Beads.....9
- Chromosphere-T Certified Size Standard Beads.....10
- Surf-Cal Beads.....11
- Dri-Cal Particle Size Standard Beads.....12
- 4D Series Size Standard Beads.....13

## Count Controls

- 3K-4K Series Duke Standards.....16
- Validex Count Precision Standards Beads.....17
- Ezy-Cal.....17
- Pharm-trol.....18
- Count-Cal Beads.....19

## Flow Cytometry Beads

- Cyto-Cal Multifluor + Violet Beads.....22
- Cyto-Cal Alignment Beads.....23
- Cyto-Cal Medium/High Intensity Alignment Beads.....24
- Cyto-Cal Absolute Count Control Beads.....24
- Cyto-Plex Multiplex Assay Beads.....25

## Dyed Beads

- Color-Rich Dyed Carboxylate-modified Beads.....28
- ChromoSphere Dyed (Dry) Beads.....29

## Fluorescent Beads

- Fluoro-Max Europium Chelate Beads.....32
- Fluoro-Max Europium Streptavidin Beads.....32
- Fluoro-Max Green, Red Dry Beads.....33
- Fluoro-Max Green, Red, Blue Aqueous Beads.....34-35

## Undyed Beads

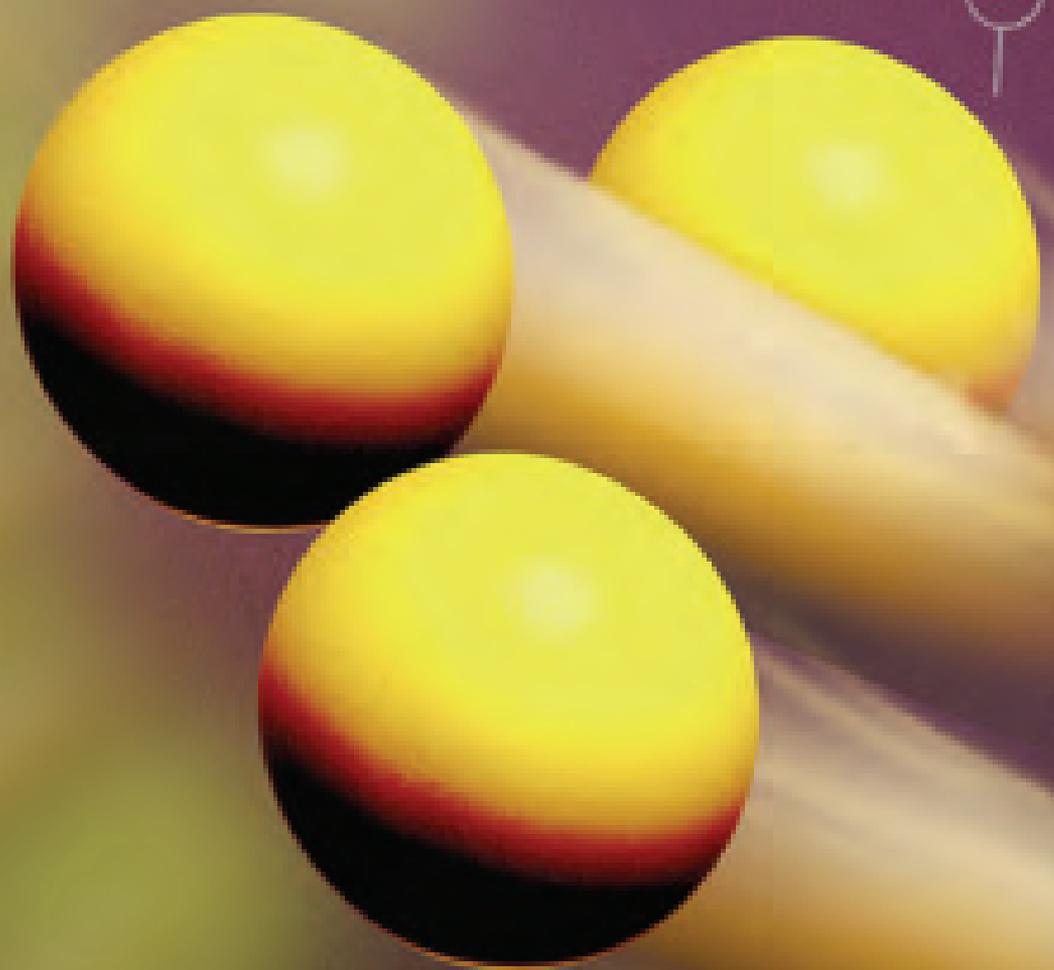
- Opti-Link Carboxylate-modified Beads.....38
- Opti-Bind Sulfate Beads.....39
- Power-Bind Streptavidin-coated.....39

## Specialty Beads

- Particulate Markers.....42
- Smoke Check Smoke Detector Challenge Beads.....43
- HEPA-Check Filter Challenge Beads.....43
- 5000 Series Beads.....44
- 7000 Series Beads.....45



# Thermo Scientific Particle Technology



# Thermo Scientific Particle Technology

## Over 35 years of expertise

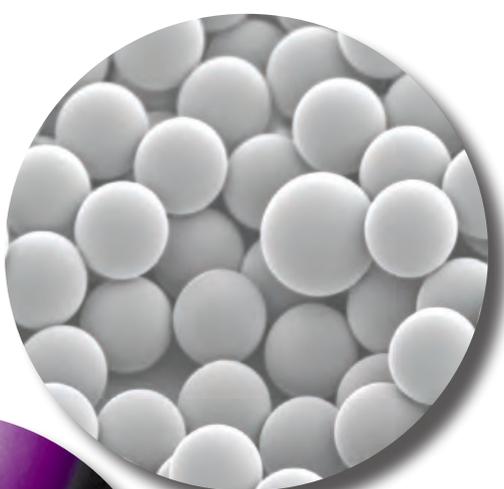
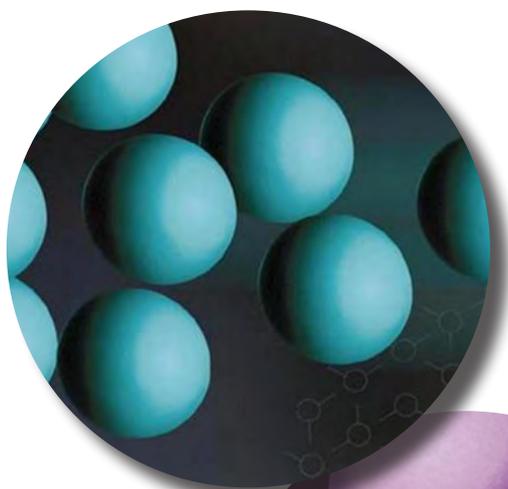
With a depth and breadth of innovative design and manufacturing experience that spans over 35 years, we are your proven, reliable source for world class particle technology solutions. Our beads are manufactured in proprietary ISO 9001 and FDA-certified facilities, resulting in products that provide:

- Precise, accurate performance
- Superior uniformity
- Excellent reproducibility
- Long-term stability

This also enables us to support you with comprehensive data about the characteristics and functionality of the beads you purchase. Customers can also count on our responsive, technical support backed by years of applications experience, training and research.

To learn more, contact us at:

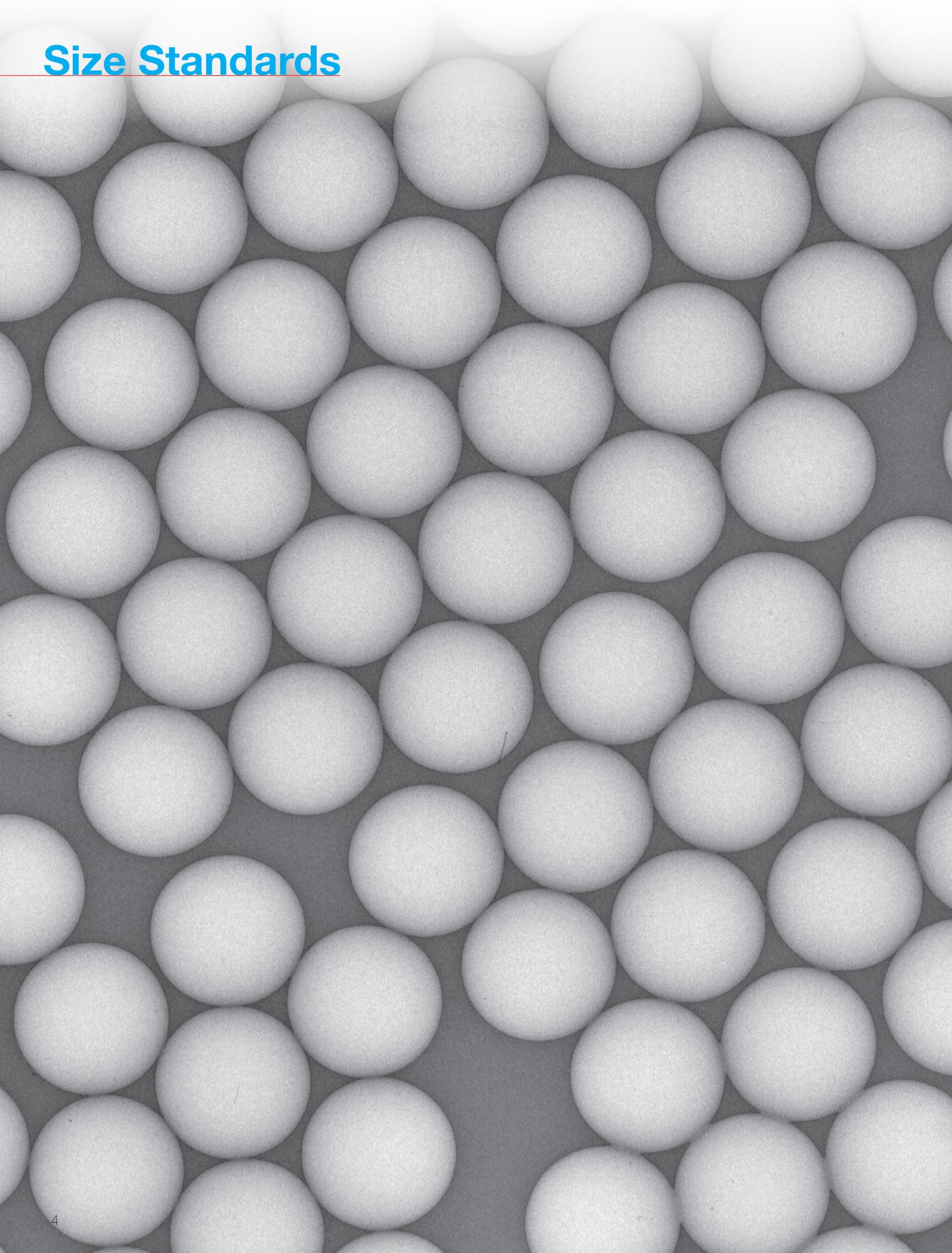
- [thermoscientific.com/particletechnology](https://thermoscientific.com/particletechnology)
- 1-800-232-3342 (Select Option 1 then Option 2 when prompted)
- 1-510-979-5000 (Select Option 1 then Option 2 when prompted)
- [info.microparticles@thermofisher.com](mailto:info.microparticles@thermofisher.com)



[thermoscientific.com/particletechnology](https://thermoscientific.com/particletechnology)



# Size Standards



# Calibrate instrument performance

## Enhance product development

When particle sizing instruments are used for solving real-world analytical problems, QC and calibration lab managers rely upon Thermo Scientific NIST Traceable Size Standards as a third party reference to calibrate and check their performance. NIST traceability gives the calibrated instrument an unbroken chain of measurements that goes back to the standard meter at the governmental office at the National Institute of Standards and Technology. The paperwork supplied helps in audits by answering the question: “How do you know the instrument is measuring properly?”



### Key Applications

- Instrument calibration, development and testing: particle sizers, particle counters
- Instrument QC: check for instrument problems and shifts in laser function, checks the calibration curve shape, etc.
- Equipment efficiency studies: vial cleaning, contamination studies, filter testing (including filter leaks), broad distribution material analysis
- Spacers: liquid crystal displays, precision microelectronics

Common Features	Benefits
Certificate of Analysis and Traceability to the National Institute of Standards and Technology (NIST)	Enables labs to demonstrate the traceability of their analytical methods as required by ISO, ANSI/NCSL Z540, GMP/GLP and other standards and regulations
Open platform	Works without bias or restriction to the most widely used instrument brands or models
Superior particle diameter uniformity	Ensures tight size distribution of the particle population to provide more exact calibration points when setting the calibration curve
Excellent product stability	Results in reliable instrument performance with confident results
Excellent lot-to-lot reproducibility	Minimizes size shift between calibrations
Packaged in dropper-tipped bottles	Easy-to-use; minimizes operator error by delivering the precise volume of beads into the instrument
Various polystyrene, silica and glass beads available in a broad range of sizes	Meets a broad range of instrument needs and applications

See available Size Standards on the following pages...

# Size Standards

## 2000 Series - Uniform Polymer Beads

### Applications

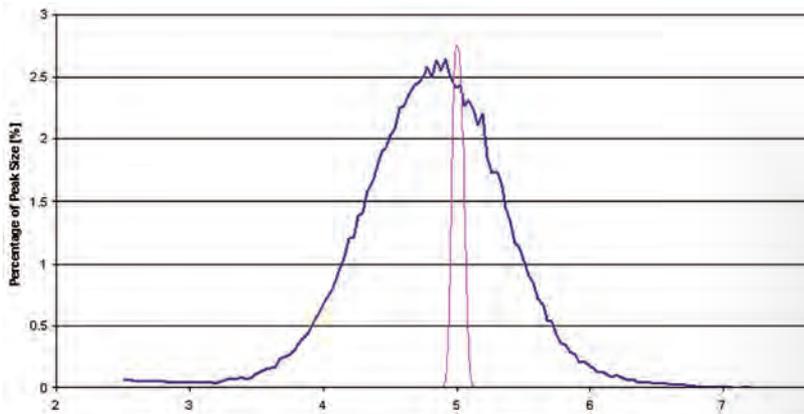
- Laser diffraction
- Analyzing material with a broad size distribution such as concrete, food ingredients, pharmaceutical solids, slurries, powders, granules, grains, and more

The Thermo Scientific™ 2000 Series Duke Standards™ are NIST traceable uniform polymer beads that provide a wider distribution of the particle population as compared to the tighter distribution provided by our monodisperse 3000 and 4000 Series of size standards.

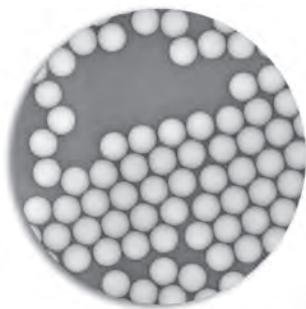
Broader size distribution provides more repeatable results for a variety of laser diffraction instruments

Nominal Diameter	Bottle Size	% Solids	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy			
5 µm	15 mL	1%	2005A
6 µm	15 mL	1%	2006A
7 µm	15 mL	1%	2007A
8 µm	15 mL	1%	2008A
9 µm	15 mL	1%	2009A
10 µm	15 mL	1%	2010A
11 µm	15 mL	1%	2011A
14 µm	15 mL	1%	2014A
15 µm	15 mL	1%	2015A
20 µm	15 mL	1%	2020A
25 µm	15 mL	1%	2025A
30 µm	15 mL	1%	2030A
40 µm	15 mL	1%	2040A

Composition: Polystyrene divinylbenzene (PS/DVB)  
Density: 1.05 g/cm<sup>3</sup>  
Index of Refraction: 1.59 @ 589 nm (25°C)  
Additives: Contains trace amount of surfactant



This graph shows a comparison between our 4205A (see red line) and 2005A (see blue line) beads. Both have a nominal diameter of 5 µm, but the 2005A has a wider distribution of beads while our 4205A has a very narrow distribution. The 2000 Series standard provides more repeatable results for various types of laser diffraction instruments.



## 3000 Series - Monodispersed Beads

Nominal Diameter	Bottle Size	% Solids	Catalog Number
Aqueous Suspensions, Calibrated by Photon Correlation Spectroscopy (PCS)			
20 nm	15 mL	1%	3020A
30 nm	15 mL	1%	3030A
40 nm	15 mL	1%	3040A
Aqueous Suspensions, Calibrated by Transmission Electron Microscopy (TEM)			
50 nm	15 mL	1%	3050A
60 nm	15 mL	1%	3060A
70 nm	15 mL	1%	3070A
80 nm	15 mL	1%	3080A
90 nm	15 mL	1%	3090A
100 nm	15 mL	1%	3100A
125 nm	15 mL	1%	3125A
150 nm	15 mL	1%	3150A
200 nm	15 mL	1%	3200A
220 nm	15 mL	1%	3220A
240 nm	15 mL	1%	3240A
270 nm	15 mL	1%	3269A
300 nm	15 mL	1%	3300A
350 nm	15 mL	1%	3350A
400 nm	15 mL	1%	3400A
450 nm	15 mL	1%	3450A
500 nm	15 mL	1%	3495A
500 nm	15 mL	1%	3500A
560 nm	15 mL	1%	3560A
600 nm	15 mL	1%	3600A
700 nm	15 mL	1%	3700A
800 nm	15 mL	1%	3800A
900 nm	15 mL	1%	3900A

Composition: Polystyrene divinylbenzene (PS/DVB)  
 Density: 1.05 g/cm<sup>3</sup>  
 Index of Refraction: 1.59 @ 589 nm (25°C)  
 Additives: Contains trace amount of surfactant

### Applications

- Instrument calibration
- Microscopy, light scattering studies and colloidal systems research
- Checking various sizes of bacterial, viral, ribosomal and sub-cellular components

The 3000 Series of monodispersed size standards have a very narrow standard deviation since they are calibrated in nanometers (billionths of a meter) using NIST traceable methodology. One nanometer is 0.001  $\mu\text{m}$  or 10 Angstroms.

These highly uniform sulfate beads are packaged as aqueous suspensions in 15 mL dropper-tipped bottles in concentrations optimized for ease of dispersion and colloidal stability.

**Note:** Due to minor variations between batches, size ranges may change slightly from batch to batch.



# Size Standards

## 4000 Series - Monosized Beads

### Applications

- **Instrument calibration, microscopy, light scattering studies and colloidal systems research**

The nominal diameter of Thermo Scientific 4000 Series Duke Standards monosized beads is calibrated with NIST traceable microscopy methods, while the size distribution and uniformity is measured by electrical resistance analysis or optical microscopy.

- Beads with a nominal diameter from  $1\ \mu\text{m}$  to  $160\ \mu\text{m}$  are made from polystyrene and packaged as aqueous suspensions in 15 mL dropper-tipped bottles in optimum concentrations for easy dispersion, handling and dilution
- Beads with nominal diameters of  $200\ \mu\text{m}$  to  $650\ \mu\text{m}$  are packaged as dry particles. They are made from polystyrene crosslinked with divinylbenzene. The two largest beads ( $750\ \mu\text{m}$  and  $1000\ \mu\text{m}$ ) are polymer products

Nominal Diameter	Bottle Size	% Solids	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy			
1.0 $\mu\text{m}$	15 mL	1.0%	4009A
1.0 $\mu\text{m}$	15 mL	1.0%	4010A
1.1 $\mu\text{m}$	15 mL	1.0%	4011A
1.3 $\mu\text{m}$	15 mL	1.0%	4013A
1.6 $\mu\text{m}$	15 mL	1.0%	4016A
1.8 $\mu\text{m}$	15 mL	1.0%	4018A
2.0 $\mu\text{m}$	15 mL	0.4%	4202A
2.5 $\mu\text{m}$	15 mL	0.5%	4025A
3.0 $\mu\text{m}$	15 mL	0.5%	4203A
4.0 $\mu\text{m}$	15 mL	0.4%	4204A
5.0 $\mu\text{m}$	15 mL	0.3%	4205A
6.0 $\mu\text{m}$	15 mL	0.3%	4206A
7.0 $\mu\text{m}$	15 mL	0.3%	4207A
8.0 $\mu\text{m}$	15 mL	0.3%	4208A
9.0 $\mu\text{m}$	15 mL	0.3%	4209A
10 $\mu\text{m}$	15 mL	0.2%	4210A
12 $\mu\text{m}$	15 mL	0.2%	4212A
15 $\mu\text{m}$	15 mL	0.3%	4215A
20 $\mu\text{m}$	15 mL	0.3%	4220A
25 $\mu\text{m}$	15 mL	0.5%	4225A
30 $\mu\text{m}$	15 mL	0.6%	4230A
40 $\mu\text{m}$	15 mL	0.7%	4240A
50 $\mu\text{m}$	15 mL	1.4%	4250A
60 $\mu\text{m}$	15 mL	1.2%	4260A
70 $\mu\text{m}$	15 mL	2.0%	4270A
80 $\mu\text{m}$	15 mL	1.8%	4280A
100 $\mu\text{m}$	15 mL	2.1%	4310A
115 $\mu\text{m}$	15 mL	2.6%	4311A
140 $\mu\text{m}$	15 mL	4.0%	4314A
160 $\mu\text{m}$	15 mL	4.8%	4316A
Uniform Dry Spheres, Calibrated by Optical Microscopy			
200 $\mu\text{m}$	1 gram	$2.3 \times 10^5$ #/g	4320A
240 $\mu\text{m}$	1 gram	$1.3 \times 10^5$ #/g	4324A
280 $\mu\text{m}$	1 gram	$8.3 \times 10^4$ #/g	4328A
300 $\mu\text{m}$	1 gram	$6.7 \times 10^4$ #/g	4330A
400 $\mu\text{m}$	1 gram	$2.8 \times 10^4$ #/g	4340A
500 $\mu\text{m}$	1 gram	$1.4 \times 10^4$ #/g	4350A
550 $\mu\text{m}$	1 gram	$1.1 \times 10^4$ #/g	4355A
650 $\mu\text{m}$	1 gram	$6.6 \times 10^3$ #/g	4365A
Uniform Dry Spheres, Calibrated by Optical Microscopy - Polymer			
750 $\mu\text{m}$	1 gram	$3.8 \times 10^3$ #/g	4375A
1000 $\mu\text{m}$	1 gram	$1.6 \times 10^3$ #/g	4400A

Composition: Polystyrene (except where noted)  
 Density:  $1.05\ \text{g/cm}^3$ ; for polymer:  $1.19\ \text{g/cm}^3$   
 Index of Refraction:  $1.59$  @ 589 nm (25°C); for polymer:  $1.49$  @ 589 nm (25°C)  
 Additives: Contains trace amount of surfactant

# Size Standards

## 8000 Series - Silica Beads

Nominal Diameter	Bottle Size	% Solids	Catalog Number
0.5 µm	15 mL	2.0%	8050
0.7 µm	15 mL	2.0%	8070
1.0 µm	15 mL	2.0%	8100
1.6 µm	15 mL	2.0%	8150

Composition: Amorphous silica  
 Density: 1.8 to 2.2 g/cm<sup>3</sup>  
 Index of Refraction: 1.40 to 1.46 @ 589 nm (25°C)  
 Additives: None

### Applications

- Instrument calibration, microscopy, light scattering studies, colloidal systems research

These opaque Thermo Scientific 8000 Series Duke Standards beads provide more contrast than polymer beads in optical and electron beams.

## 9000 Series - Glass Beads

Nominal Diameter	Bottle Size	Approximate Count Per Gram	Catalog Number
Uniform Borosilicate Glass Dry Spheres - Calibrated by Optical Microscopy			
2 µm	1 gram	9.5 x 10 <sup>10</sup>	9002
5 µm	1 gram	6.1 x 10 <sup>9</sup>	9005
8 µm	1 gram	1.5 x 10 <sup>9</sup>	9008
10 µm	1 gram	7.6 x 10 <sup>8</sup>	9010
15 µm	1 gram	2.3 x 10 <sup>8</sup>	9015
20 µm	1 gram	9.5 x 10 <sup>7</sup>	9020
Uniform Soda Lime Glass Dry Spheres - Calibrated by Optical Microscopy			
30 µm	1 gram	2.8 x 10 <sup>7</sup>	9030
40 µm	1 gram	1.2 x 10 <sup>7</sup>	9040
50 µm	1 gram	6.1 x 10 <sup>6</sup>	9050
60 µm	1 gram	3.5 x 10 <sup>6</sup>	9060
70 µm	1 gram	2.2 x 10 <sup>6</sup>	9070
80 µm	1 gram	1.5 x 10 <sup>6</sup>	9080
90 µm	1 gram	1.0 x 10 <sup>6</sup>	9090
100 µm	1 gram	7.6 x 10 <sup>5</sup>	9100
110 µm	1 gram	5.7 x 10 <sup>5</sup>	9110
120 µm	1 gram	4.4 x 10 <sup>5</sup>	9120
140 µm	1 gram	2.8 x 10 <sup>5</sup>	9140
170 µm	1 gram	1.6 x 10 <sup>5</sup>	9170
200 µm	1 gram	9.5 x 10 <sup>4</sup>	9200
230 µm	1 gram	6.3 x 10 <sup>4</sup>	9230
280 µm	1 gram	3.5 x 10 <sup>4</sup>	9280
330 µm	1 gram	2.1 x 10 <sup>4</sup>	9330
400 µm	1 gram	1.2 x 10 <sup>4</sup>	9400
480 µm	1 gram	6.9 x 10 <sup>3</sup>	9480
550 µm	1 gram	4590	9550
650 µm	1 gram	2780	9650
750 µm	1 gram	1810	9750
950 µm	1 gram	890	9950
1000 µm	1 gram	760	91000
2000 µm	1 gram	95	92000

Composition: Borosilicate\* or soda lime\*\* glass  
 Density: \*2.5 - 2.55 g/cm<sup>3</sup>; \*\*2.4 - 2.6 g/cm<sup>3</sup>  
 Index of Refraction: \*1.56 @ 589 nm (25°C); \*\*1.50 - 1.52 @ 589 nm (25°C)  
 Additives: None

### Applications

- Particle measurement, spacers

Available as NIST traceable uniform borosilicate or soda lime glass beads, the Thermo Scientific 9000 Series Duke Standards provide greater tolerance to chemicals and solvents than non-glass beads, and have a higher mechanical and thermal stability.

Our process also ensures the removal of any non-spherical and broken beads.



# Size Standards

## Chromosphere-T - Black and Red (Dry)

### Applications

- Vial washing studies
- Light microscopy

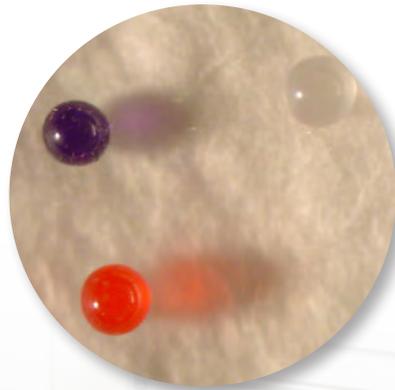
NIST traceable ChromoSphere-T polymer beads are internally and deeply dyed with intense red or black dyes that provide very high contrast and visibility relative to most background materials.

Available as dry powders, they can be easily suspended in aqueous media with the aid of a small amount of surfactant or in lower alcohols such as methanol or ethanol.

**Note:** Some dye extraction will occur when the beads are suspended in pure alcohols, but it will be minimal. Other organic solvents, such as ethers or chlorinated hydrocarbons, should be avoided because they will swell the beads and completely extract the dye.

Nominal Diameter	Bottle Size	Approximate Count Per Gram	Color	Catalog Number
Dry Dyed Particles, Calibrated by Optical Microscopy				
50 µm	1 gram	$1.5 \times 10^7$	Red	RD050T
50 µm	1 gram	$1.5 \times 10^7$	Black	BK050T
100 µm	1 gram	$1.8 \times 10^6$	Red	RD100T
100 µm	1 gram	$1.8 \times 10^6$	Black	BK100T
150 µm	1 gram	$5.4 \times 10^5$	Red	RD150T
150 µm	1 gram	$5.4 \times 10^5$	Black	BK150T
200 µm	1 gram	$2.3 \times 10^5$	Red	RD200T
200 µm	1 gram	$2.3 \times 10^5$	Black	BK200T
300 µm	1 gram	$6.6 \times 10^4$	Red	RD300T
300 µm	1 gram	$6.6 \times 10^4$	Black	BK300T
400 µm	1 gram	$2.8 \times 10^4$	Red	RD400T
400 µm	1 gram	$2.8 \times 10^4$	Black	BK400T
500 µm	1 gram	$1.4 \times 10^4$	Red	RD500T
500 µm	1 gram	$1.4 \times 10^4$	Black	BK500T

Composition: Polystyrene Divinylbenzene (PS-DVB)  
Density: 1.05 g/cm<sup>3</sup>  
Index of Refraction: 1.59 @ 589 nm (25°C)  
Additives: None



# Size Standards

## Surf-Cal

Certified Peak Diameter	Expanded Uncertainty (of peak diameter)	Size Distribution			Bottle Size	Catalog Number (particles per mL)	
		Std. Dev.	CV%	FWHM%		$3 \times 10^8$	$10^{10}$
Aqueous Suspensions, Calibrated by TEM or Optical Microscopy							
0.047 $\mu\text{m}$	0.002 $\mu\text{m}$	0.004 $\mu\text{m}$	7.5%	17.4%	50 mL	PD-047	PD-047B
0.064 $\mu\text{m}$	0.002 $\mu\text{m}$	0.003 $\mu\text{m}$	5.4%	10.9%	50 mL	PD-064	PD-064B
0.083 $\mu\text{m}$	0.002 $\mu\text{m}$	0.004 $\mu\text{m}$	4.2%	9.6%	50 mL	PD-083	PD-083B
0.092 $\mu\text{m}$	0.005 $\mu\text{m}$	0.004 $\mu\text{m}$	4.6%	9.1%	50 mL	PD-092	PD-092B
0.100 $\mu\text{m}$	0.005 $\mu\text{m}$	0.004 $\mu\text{m}$	2.6%	5.2%	50 mL	PD-100	PD-100B
0.126 $\mu\text{m}$	0.006 $\mu\text{m}$	0.003 $\mu\text{m}$	2.4%	4.8%	50 mL	PD-125	PD-125B
0.155 $\mu\text{m}$	0.003 $\mu\text{m}$	0.003 $\mu\text{m}$	1.6%	3.7%	50 mL	PD-155	PD-155B
0.202 $\mu\text{m}$	0.005 $\mu\text{m}$	0.004 $\mu\text{m}$	1.8%	4.0%	50 mL	PD-200	PD-200B
0.204 $\mu\text{m}$	0.008 $\mu\text{m}$	0.004 $\mu\text{m}$	1.8%	3.7%	50 mL	PD-204	PD-204B
0.220 $\mu\text{m}$	0.007 $\mu\text{m}$	0.003 $\mu\text{m}$	1.6%	3.3%	50 mL	PD-215	PD-215B
0.304 $\mu\text{m}$	0.005 $\mu\text{m}$	0.004 $\mu\text{m}$	1.4%	3.4%	50 mL	PD-305	PD-305B
0.360 $\mu\text{m}$	0.013 $\mu\text{m}$	0.010 $\mu\text{m}$	2.0%	5.0%	50 mL	PD-365	PD-365B
0.498 $\mu\text{m}$	0.010 $\mu\text{m}$	0.006 $\mu\text{m}$	1.1%	2.5%	50 mL	PD-500	PD-500B
0.809 $\mu\text{m}$	0.014 $\mu\text{m}$	0.006 $\mu\text{m}$	0.8%	1.8%	50 mL	PD-800	PD-800B
0.802 $\mu\text{m}$	0.011 $\mu\text{m}$	0.009 $\mu\text{m}$	1.1%	2.4%	50 mL	PD-802	PD-802B
1.112 $\mu\text{m}$	0.018 $\mu\text{m}$	0.011 $\mu\text{m}$	1.0%	2.5%	50 mL	PD1100	PD1100B
1.59 $\mu\text{m}$	0.02 $\mu\text{m}$	0.016 $\mu\text{m}$	1.0%	2.6%	50 mL	PD1600	--
2.01 $\mu\text{m}$	0.04 $\mu\text{m}$	0.019 $\mu\text{m}$	1.0%	3.3%	50 mL	PD2000	--
3.04 $\mu\text{m}$	0.06 $\mu\text{m}$	0.026 $\mu\text{m}$	0.9%	2.7%	50 mL	PD3000	--

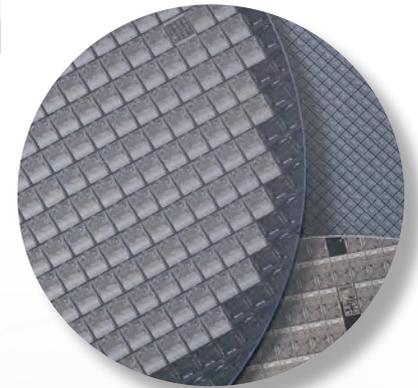
Composition: Polystyrene  
 Density: 1.05 g/cm<sup>3</sup>  
 Index of Refraction: 1.59 @ 589 nm (25°C)  
 Additives: None

### Applications

- Wafer particle deposition
- Prepare calibration wafers for testing Scanning Surface Inspection Systems used in semiconductor manufacturing

Surf-Cal size standards meet SEMI\* standard guideline M52, and feature certified diameters that have been calibrated by TEM or optical microscopy, and are traceable to the Standard Meter of the National Institute of Standards and Technology (NIST).

\*Semiconductor Equipment and Materials Inspection organization



# Size Standards

## Dri-Cal (Dry)

### Applications

- **Calibration of airborne optical particle counting instruments**
- **Aerosol studies**

Thermo Scientific Dri-Cal™ dry size standards are conveniently packaged in dropper-tipped vials for easy and direct dispersal into the sampling chamber. They are not suitable for dispersion in liquid media.

- Each package contains a Certificate of Calibration and Traceability to NIST which includes a description of the calibration method and its uncertainty, and a table of chemical and physical properties
- A Material Safety Data Sheet with handling and disposal instructions is also included

Nominal Diameter	Bottle Size	Approximate Count Per Gram	Catalog Number
Uniform PS-DVB Dry Spheres - Calibrated by Optical Microscopy			
5 µm	1 gram	1.4 x 10 <sup>10</sup>	DC-05
6 µm	1 gram	8.4 x 10 <sup>10</sup>	DC-06
7 µm	1 gram	5.5 x 10 <sup>9</sup>	DC-07
8 µm	1 gram	4.3 x 10 <sup>9</sup>	DC-08
10 µm	1 gram	1.8 x 10 <sup>9</sup>	DC-10
15 µm	1 gram	4.3 x 10 <sup>8</sup>	DC-15
20 µm	1 gram	2.3 x 10 <sup>8</sup>	DC-20
25 µm	1 gram	1.1 x 10 <sup>8</sup>	DC-25
50 µm	1 gram	1.4 x 10 <sup>7</sup>	DC-50
70 µm	1 gram	5.7 x 10 <sup>6</sup>	DC-70
100 µm	1 gram	2.0 x 10 <sup>6</sup>	DC100

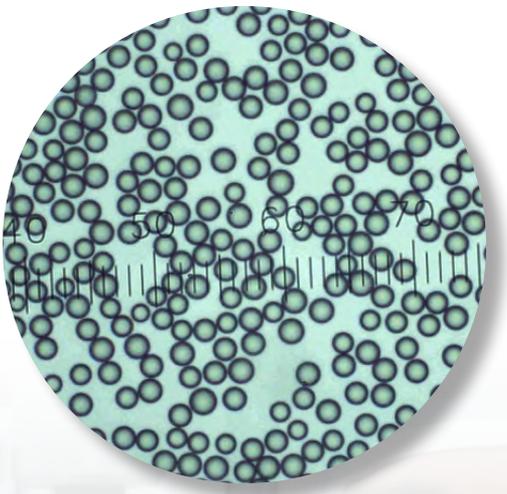
Composition: Polystyrene Divinylbenzene (PS-DVB)  
 Density: 1.05 g/cm<sup>3</sup>  
 Index of Refraction: 1.59 @ 589 nm (25°C)  
 Additives: Trace flow agent may be present

# Size Standards

## 4D Series (Dry)

Nominal Diameter	Mean Size Uncertainty	Bottle Size	Approximate Count Per Gram	Catalog Number
Uniform PS-DVB Dry Spheres - Calibrated by Optical Microscopy				
3 $\mu\text{m}$	$\leq 2.5\%$	1 gram	$6.7 \times 10^{10}$	4D-03
5 $\mu\text{m}$	$\leq 2.5\%$	1 gram	$1.4 \times 10^{10}$	4D-05
7 $\mu\text{m}$	$\leq 2.5\%$	1 gram	$5.3 \times 10^9$	4D-07
10 $\mu\text{m}$	$\leq 2.5\%$	1 gram	$1.8 \times 10^9$	4D-10

Composition: Polystyrene  
Density: 1.05 g/cm<sup>3</sup>  
Index of Refraction: 1.59 @ 589 nm (25°C)  
Additives: Trace flow agent may be present



### Applications

- Calibrate airborne optical particle counters in pharmaceutical and electronic manufacturing labs and cleanrooms

With a mean size standard uncertainty of  $\leq 2.5\%$ , these beads can calibrate airborne optical particle counters (OPC) in compliance with ISO 21501-4. This makes them ideal for OPC instrument manufacturers and service providers working to the ISO standard, as well as pharmaceutical, health care, and biotech companies manufacturing products with ISO 21501-4 certified OPCs in a ISO 14644 classified cleanroom.

- Certificate of Calibration and Traceability to NIST
- Improves the repeatability and reproducibility of OPCs



# Count Controls



# Validate and document results

## Achieve QC compliance

Accurate measurement of particulate matter using laser particle counters is critical wherever air, surface or liquid contamination is a concern and requires diligent monitoring. Thermo Scientific Count Controls validate the results of these instruments regardless of brand to ensure they are measuring properly. Otherwise, users risk working with potentially misleading and inconsistent data that could lead to costly, time-consuming errors. With a diameter traceable to the National Institute of Standards and Technology (NIST), our Count Controls provide the confidence and paperwork required by QC that the instrument is doing precisely what is was intended for.



### Key Applications

- Instrument calibration and validation: particles counters using laser scatter, light scatter, light blockage, imaging, microscopy, and electrical resistance
- Instrument QC: check for instrument problems and shifts in laser function, check the calibration curve shape, etc.
- Monitor for particulate matter: for manufacturers of parenteral drugs and ophthalmic solutions

Common Features	Benefits
Highly uniform mean diameters are traceable to the standard meter through the National Institute of Standards and Technology (NIST)	Provides a simple, convenient method for calibrating particle counting instrumentation, ensuring accurate instrument performance
Includes Certificate of Calibration and Traceability to NIST	Provides documented, objective evidence for compliance with most QC programs
Calculated, measured concentration with established ranges	Simplifies and speeds dilution and sample prep process; increases confidence in the results
Open platform	Works without bias or restriction to the most widely used instrument brands or models
Superior particle diameter uniformity	Ensures tight size distribution of the particle population to provide more exact calibration points when setting the calibration curve
Excellent product stability	Ensures reliable, accurate instrument performance
Prepared and supplied as a low residue aqueous suspension	Allows for minimal background interference and more precise insight into the dynamic range and calibration of the instrument

See available Size Standards on the following pages...

# Count Controls

## 3K/4K Series

### Applications

- **Calibrating air or liquid particle counting instruments**
- **Developing new analytical instruments**

These NIST traceable, monodisperse polystyrene 3K/4K beads are prepared as suspensions in a low residue diluent to minimize any background interference.

- Allows for precise calibration and insight into the dynamic range and calibration of the instrument
- Minimizes the need for multiple, time-consuming adjustments of the concentration during sample preparation



Nominal Diameter	Bottle Size	Approximate #/mL	Catalog Number
Aqueous Suspensions, Calibrated by Transmission Electron Microscopy (TEM)			
0.1 µm	15 mL	10 <sup>9</sup>	3K-100
0.15 µm	15 mL	10 <sup>9</sup>	3K-150
0.2 µm	15 mL	10 <sup>9</sup>	3K-200
0.22 µm	15 mL	10 <sup>9</sup>	3K-220
0.27 µm	15 mL	10 <sup>9</sup>	3K-269
0.3 µm	15 mL	10 <sup>9</sup>	3K-300
0.35 µm	15 mL	10 <sup>9</sup>	3K-350
0.4 µm	15 mL	10 <sup>9</sup>	3K-400
0.5 µm	15 mL	10 <sup>9</sup>	3K-500
0.6 µm	15 mL	10 <sup>9</sup>	3K-600
0.7 µm	15 mL	10 <sup>9</sup>	3K-700
0.8 µm	15 mL	10 <sup>9</sup>	3K-800
0.9 µm	15 mL	10 <sup>9</sup>	3K-900
Aqueous Suspensions, Calibrated by Optical Microscopy			
1.0 µm	15 mL	10 <sup>9</sup>	3K-990
1.0 µm	15 mL	10 <sup>9</sup>	3K1000
1.6 µm	15 mL	10 <sup>9</sup>	3K1600
2.0 µm	15 mL	5 x 10 <sup>6</sup>	4K-02
3.0 µm	15 mL	5 x 10 <sup>7</sup>	4K-03
4.0 µm	15 mL	5 x 10 <sup>7</sup>	4K-04
5.0 µm	15 mL	10 <sup>7</sup>	4K-05
6.0 µm	15 mL	10 <sup>7</sup>	4K-06
7.0 µm	15 mL	10 <sup>7</sup>	4K-07
10 µm	15 mL	10 <sup>6</sup>	4K-10
15 µm	15 mL	10 <sup>6</sup>	4K-15
20 µm	15 mL	3 x 10 <sup>5</sup>	4K-20
25 µm	15 mL	3 x 10 <sup>5</sup>	4K-25
30 µm	15 mL	3 x 10 <sup>5</sup>	4K-30
40 µm	15 mL	8 x 10 <sup>4</sup>	4K-40
50 µm	15 mL	8 x 10 <sup>4</sup>	4K-50
60 µm	15 mL	8 x 10 <sup>4</sup>	4K-60
70 µm	15 mL	8 x 10 <sup>4</sup>	4K-70
80 µm	15 mL	3 x 10 <sup>4</sup>	4K-80
100 µm	15 mL	3 x 10 <sup>4</sup>	4K100

Composition: Polystyrene  
 Density: 1.05 g/cm<sup>3</sup>  
 Index of Refraction: 1.59 @ 589 nm (25°C)  
 Additives: Contains trace amount of surfactant

# Count Controls

## Ezy-Cal

Nominal Diameter	Bottle Size	Count/mL	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy			
2 µm	100 mL	2000/mL ± 10%	6002
5 µm	100 mL	2000/mL ± 10%	6005
10 µm	100 mL	2000/mL ± 10%	6010
15 µm	100 mL	2000/mL ± 10%	6015
20 µm	100 mL	2000/mL ± 10%	6020
25 µm	100 mL	2000/mL ± 10%	6025
30 µm	100 mL	2000/mL ± 10%	6030
50 µm	100 mL	2000/mL ± 10%	6050
70 µm	100 mL	2000/mL ± 10%	6070

Composition: Polystyrene  
Density: 1.05 g/cm<sup>3</sup>  
Index of Refraction: 1.59 @ 589 nm (25°C)  
Additives: Contains trace amount of surfactant

### Applications

- **Calibrating, validating and testing liquid particle counters**
- **Pharmaceutical, food, beverage, wastewater**

Each bottle of Thermo Scientific Ezy-Cal™ beads includes a magnetic stir bar for resuspension of the NIST traceable beads for clean, convenient and direct sampling by instruments.

- Contains a combination of dispersing agents to keep the beads from clumping or sticking to flow surfaces in the particle counter

## Validex

Nominal Diameter	Bottle Size	Count/mL	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy			
5 µm	500 mL	1000/mL ± 10%	CRS-05
10 µm	500 mL	1000/mL ± 10%	CRS-10

Composition: Polystyrene  
Density: 1.05 g/cm<sup>3</sup>  
Index of Refraction: 1.59 @ 589 nm (25°C)  
Additives: Contains trace amount of surfactant

### Applications

- **Validating the performance of liquid particle counters**
- **Drinking water / wastewater industry**

Thermo Scientific Validex™ count controls contain NIST traceable polymer beads packaged in ultra-pure water at concentrations.

The suspension has been optimized to promote dispersion of the beads. If needed, a stir bar is included to aid dispersion.

# Count Controls

## Pharm-trol

### Applications

- Validating liquid particle counters to meet global pharmaceutical regulations
- Checking for particulate matter in injections

Thermo Scientific Pharm-Trol™ count controls contain NIST traceable size standards with a measured particle count. This enables you to document the reproducibility of liquid particle counters between instruments by permitting a continuous record of its performance using a particle suspension with a known concentration.

The resulting data provides the documentation needed for manufacturers to meet internal or customer quality audits.

Nominal Diameter	Bottle Size	Count/mL	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy			
15 µm	6 x 25 mL	3800/mL ± 15%	CS-PK
15 µm	20 X 25 mL	3800/mL ± 15%	CS-BX

Composition: Polystyrene  
Density: 1.05 g/cm<sup>3</sup>  
Index of Refraction: 1.59 @ 589 nm (25°C)  
Additives: Contains trace amount of surfactant



### Pharm-trol and Count-Cal Beads Comply with:

- United States Pharmacopoeia (USP) <729>, <788>, and <1027>
- China Pharmacopoeia (Ch P 2010, Vol III, App. V)
- European Pharmacopoeia (Ph. Eur.) 2.9.19, 2.7.24
- Japan Pharmacopoeia (JP) 6.07

# Count Controls

## Count-Cal

Nominal Diameter	Bottle Size	Count/mL	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy			
2 µm	6 x 25 mL	3000/mL ± 10%	CC02-PK
5 µm	6 x 25 mL	3000/mL ± 10%	CC05-PK
10 µm	6 x 25 mL	3000/mL ± 10%	CC10-PK
15 µm	6 x 25 mL	3000/mL ± 10%	CC15-PK
20 µm	6 x 25 mL	3000/mL ± 10%	CC20-PK
25 µm	6 x 25 mL	3000/mL ± 10%	CC25-PK
30 µm	6 x 25 mL	3000/mL ± 10%	CC30-PK
50 µm	6 x 25 mL	3000/mL ± 10%	CC50-PK
70 µm	6 x 25 mL	3000/mL ± 10%	CC70-PK

Composition: Polystyrene  
Density: 1.05 g/cm<sup>3</sup>  
Index of Refraction: 1.59 @ 589 nm (25°C)  
Additives: Contains trace amount of surfactant

### Applications

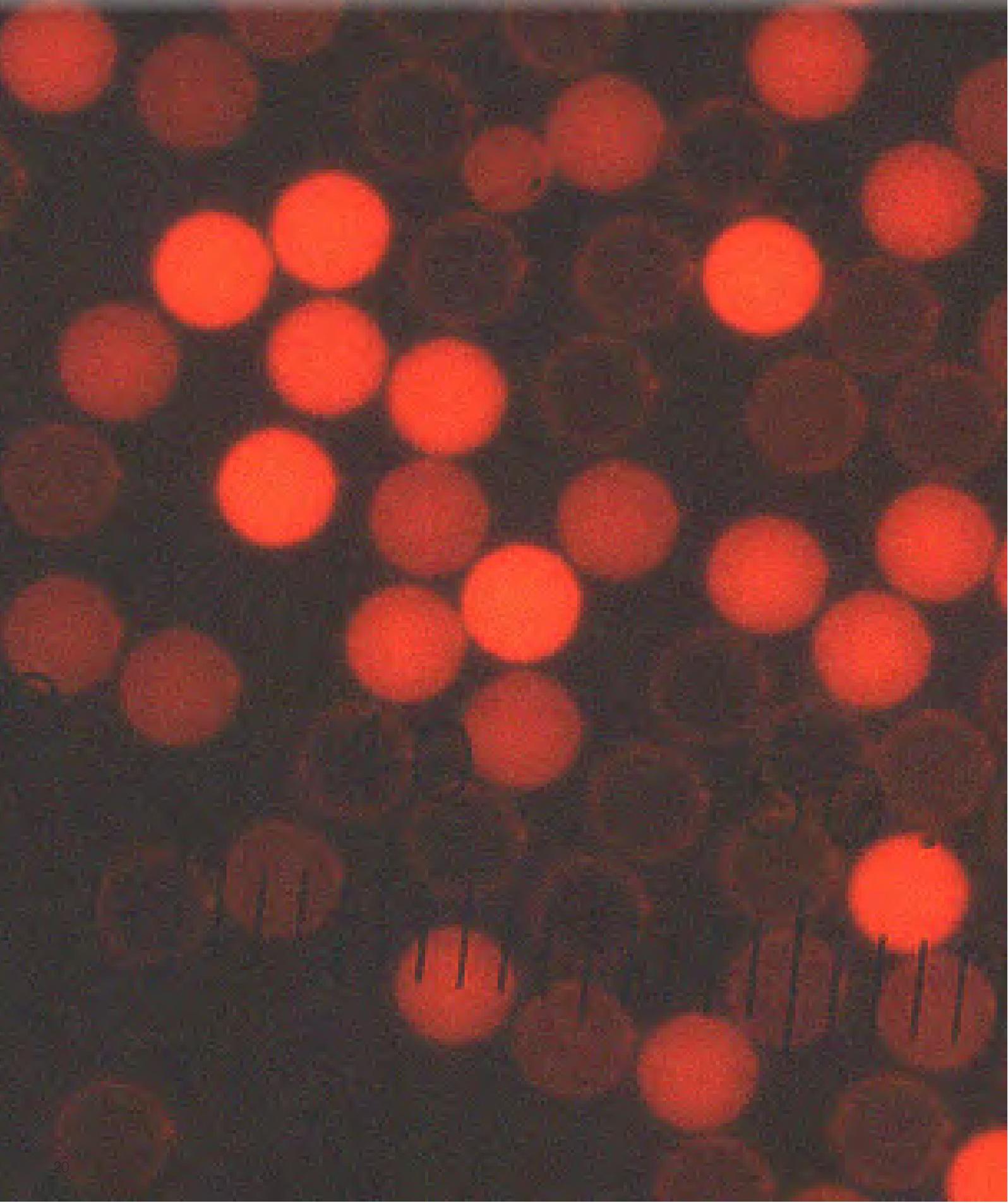
- Calibrating liquid particle counters to meet global pharmaceutical regulations
- Calibrating light obscuration particle counters and other low concentration counting instruments

Thermo Scientific Count-Cal™ count controls feature NIST traceable diameters, enabling manufacturers of parenteral drugs and injectable solutions to calibrate and document the reproducibility of liquid particle counting instruments.

### Pharm-trol and Count-Cal Beads:

- Packaged in ready-to-use, single-use bottles for direct sampling.
- Eliminate the need for serial dilutions and extensive sample handling.
- Minimize chance for contamination.

# Flow Cytometry Beads



# Optimize instrument performance

## Calibrate, align, count and analyze

In flow cytometry labs, the process of sizing, sorting, isolating and analyzing cells requires robust, precise instruments that deliver consistent and accurate data. To ensure optimal performance and results between instruments, we offer two distinct products: 1) Thermo Scientific Cyto-Cal™ beads for calibration, alignment, counting and instrument set-up to ensure flow and optical stability, and 2) Thermo Scientific Cyto-Plex™ Multiplex Assay beads for developing assays used for the simultaneous detection and quantitation of up to 24 different analytes within a sample. For high throughput absolute cell counting applications, consider our Cyto-Cal Count Plate.



### Applications

- Instrument calibration: Cyto-Cal Multifluor + Violet Intensity beads ensure the laser and optics are performing to specification
- Instrument alignment: Cyto-Cal Alignment beads ensure the laser and flow cell are properly aligned
- Counting: Cyto-Cal Absolute Count Control beads ensure the proper capture of the number of cells. The Cyto-Cal Count Plate is for high throughput applications
- Multiplexing: Combine 4  $\mu\text{m}$  and 5  $\mu\text{m}$  Cyto-Plex Multiple Assay beads to increase numbers of analytes measured per test

Common Features	Benefits
Optimized size and dye intensity uniformity with low fluorescent CV's	Monitors instrument performance for better data accuracy
Open platform	Works without bias or restriction to the most widely used flow cytometer brands or models
Dye is incorporated internally throughout the polymer for high stability	Prevents leaching and results in thermal and photolytic stability for at least 24 months. This also makes them a highly consistent reference to base instrument settings
Excellent lot-to-lot reproducibility	Results in reliable performance with confident results between experiments, labs and instruments
Packaged in dropper-tipped bottles (Cyto-Cal beads)	Easy-to-use; minimizes operator error by delivering the precise volume of beads into the instrument

See available Flow Cytometry Beads on the following pages...

# Flow Cytometry Beads

## Cyto-Cal Multifluor + Violet Calibrator

### Key Applications

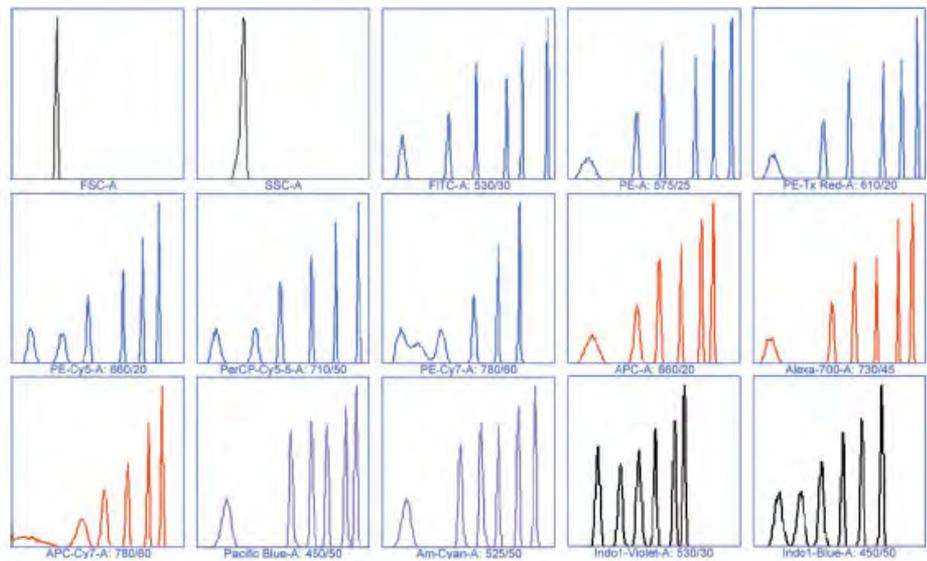
- **Instrument calibration**

The Cyto-Cal Multifluor + Violet Intensity Calibrator monitors laser and optical performance across a range of fluorescent intensity levels to improve linearity and sensitivity. It includes uniform beads with green, orange, blue and red dyes in 5 different fluorescent intensities, plus one undyed bead

- Beads are so uniform that no singlet gating is required since they form a very tight cluster in the forward/side scatter plots
- Each fluorescent intensity level has a Mean Equivalent Soluble Fluorochrome (MESF) value for multiple instruments and filter sets. This enables you to generate standard curves that are more accurate for your specific instrument
- Capable of working with blue, red and violet lasers

Nominal Diameter	Bottle Size	Description	Catalog Number
	Aqueous Suspensions, Calibrated by Optical Microscopy		
~ 3 µm	2 mL (50 tests)	Visible with blue, red, violet lasers	FC3MV

Composition: Polystyrene particles containing encapsulated dyes  
 Dyes: Fluorescent green (488/510 nm), orange (488/575 nm), red (488,633, 635/700 nm), blue (405, 450 nm)  
 Concentration:  $1.5 \times 10^7$  particles/mL  
 Density: 1.06 g/cm<sup>3</sup>  
 Additives: 0.05% Tween® 20 dispersant/surfactant with 2 mM sodium azide preservative



The Cyto-Cal Multifluor Plus Violet Intensity Calibrator contains beads with dyes that excite and emit at the spectral ranges commonly used in flow cytometry. The figure above shows the uniformity of the bead as well as the tight fluorescent CV of the fluorescent emissions. The clear peak separation and clean base lines allow for precise gating when checking the linearity of the flow cytometer. Source: Data from BD FACS Aria™, BD Biosciences, San Jose, CA. Results may vary on different instruments.



# Flow Cytometry Beads

## Cyto-Cal Alignment Beads (488 and 633)

Nominal Diameter	Bottle Size	Description	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy			
~ 3 µm	3 mL (50 tests)	488 nm Firefli Fluorescent Orange	FA3O
~ 3 µm	3 mL (50 tests)	633 nm Firefli Fluorescent Red	FA3R

Composition: Polystyrene particles containing encapsulated dyes  
 Dyes: Fluorescent orange (488/575 nm) or red (488,633, 635/700 nm)  
 Concentration:  $0.5 \times 10^6$  particles/mL  
 Density:  $1.05 \text{ g/cm}^3$   
 Additives: 0.05% Tween 20 dispersant/surfactant with 2 mM sodium azide preservative

### Applications

#### • Instrument alignment

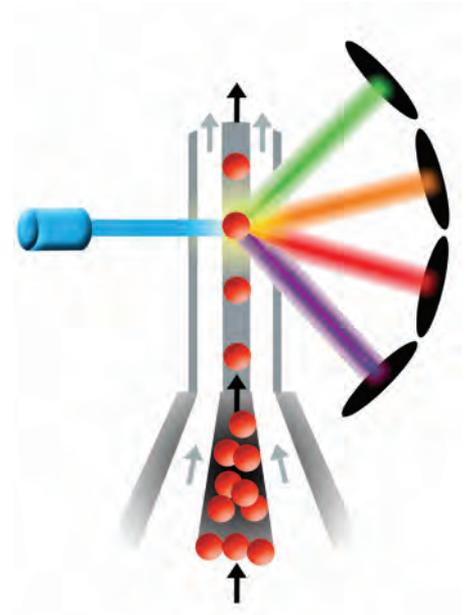
To ensure confidence in the instrument results, Cyto-Cal 488 and 633 alignment beads have the fluorescent uniformity that enables the best possible optimization of each parameter being measured to ensure the laser and flow cell are properly aligned.

#### *Cyto-Cal 488*

These beads are excited by the 488 nm spectral line of the argon laser and have broad emission, allowing them to be used to simultaneously align the FL1 (FITC), FL2 (PE) and FL3 (PE-Cy5) channels.

#### *Cyto-Cal 633*

These beads are optimally excited with the 633 nm He-Ne laser (635 nm diode laser) and have a maximum emission at 700 nm. They are designed to align the FL4 (APC) channel.



# Flow Cytometry Beads

## Cyto-Cal Medium/High Intensity Alignment

### Applications

- **Optical alignment, flow cell focusing, QC**

Cyto-Cal Multifluor plus Violet Medium and High Intensity Fluorescence Alignment Beads are a mixture of highly uniform single intensity  $\sim 3 \mu\text{m}$  nominal diameter beads with multiple encapsulated dyes. They excite at 405 nm (violet laser) 488 (blue laser) and 633 (red laser) wavelengths.

Due to their uniformity, the beads form tight clusters in the FSC/SSC plot, eliminating subjective gating.

The high intensity bead is used to optimize the overall fluorescence output for the flow cytometer by bringing the signal from the laser and stream position closer together.

The medium intensity bead is used if optimizing fluorescence intensity from the mid-point is required.

	Nominal Diameter	Bottle Size	Catalog Number
Multifluor + Violet Alignment and Set-up (high intensity)	$\sim 3 \mu\text{m}$	5 mL	FC3AVH
Multifluor + Violet Alignment and Set-up (medium intensity)	$\sim 3 \mu\text{m}$	5 mL	FC3AVM

Composition: Polystyrene carboxylate-modified beads  
 Dyes: Four encapsulated dyes  
 Concentration: Approximately  $1.5 \times 10^7$  particles per mL  
 Density:  $1.05 \text{ g/cm}^3$   
 Additives: 0.05% Tween 20 dispersant/surfactant with 2 mM sodium azide preservative



## Cyto-Cal Absolute Count Control

### Applications

- **Absolute cell counting**

Cyto-Cal absolute count controls are comprised of uniform  $7 \mu\text{m}$  beads with each containing two encapsulated dyes.

The single vial contains beads precisely stained with fluorescent dyes that have an optimized intensity and broad emission in multiple channels (FITC, PE, PE-Cy5).

The hydrophilic surface eliminates doublets, ensuring an accurate count verified by analytical procedures.

Nominal Diameter	Bottle Size	Description	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy			
$\sim 7 \mu\text{m}$	10 mL	Absolute Count Control	FC7

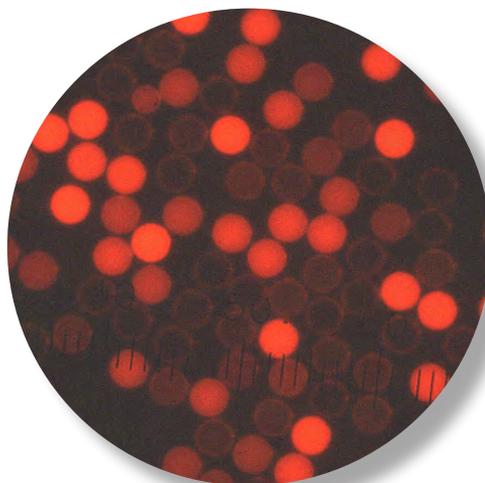
Composition: Polystyrene particles containing encapsulated dyes  
 Dyes: Fluorescent green (488/510 nm) and red (570/600 nm)  
 Concentration:  $1 \times 10^6$  particles/mL  $\pm 5\%$   
 Density:  $1.05 \text{ g/cm}^3$   
 Additives: 0.05% Tween 20 dispersant/surfactant with 2 mM sodium azide preservative

# Flow Cytometry Beads

## Cyto-Plex Multiplex Assay (Levels 1-12)

Nominal Diameter	Intensity Level	Description	Catalog Number	
			1 mL	5 mL
Aqueous Suspensions, Calibrated by Optical Microscopy				
4 µm	Level 1 (low)	Carboxylated Multiplex Fluorescent Red	FM4CR01	FM4CR01B
4 µm	Level 2	Carboxylated Multiplex Fluorescent Red	FM4CR02	FM4CR02B
4 µm	Level 3	Carboxylated Multiplex Fluorescent Red	FM4CR03	FM4CR03B
4 µm	Level 4	Carboxylated Multiplex Fluorescent Red	FM4CR04	FM4CR04B
4 µm	Level 5	Carboxylated Multiplex Fluorescent Red	FM4CR05	FM4CR05B
4 µm	Level 6	Carboxylated Multiplex Fluorescent Red	FM4CR06	FM4CR06B
4 µm	Level 7	Carboxylated Multiplex Fluorescent Red	FM4CR07	FM4CR07B
4 µm	Level 8	Carboxylated Multiplex Fluorescent Red	FM4CR08	FM4CR08B
4 µm	Level 9	Carboxylated Multiplex Fluorescent Red	FM4CR09	FM4CR09B
4 µm	Level 10	Carboxylated Multiplex Fluorescent Red	FM4CR10	FM4CR10B
4 µm	Level 11	Carboxylated Multiplex Fluorescent Red	FM4CR11	FM4CR11B
4 µm	Level 12 (high)	Carboxylated Multiplex Fluorescent Red	FM4CR12	FM4CR12B
5 µm	Level 1 (low)	Carboxylated Multiplex Fluorescent Red	FM5CR01	FM5CR01B
5 µm	Level 2	Carboxylated Multiplex Fluorescent Red	FM5CR02	FM5CR02B
5 µm	Level 3	Carboxylated Multiplex Fluorescent Red	FM5CR03	FM5CR03B
5 µm	Level 4	Carboxylated Multiplex Fluorescent Red	FM5CR04	FM5CR04B
5 µm	Level 5	Carboxylated Multiplex Fluorescent Red	FM5CR05	FM5CR05B
5 µm	Level 6	Carboxylated Multiplex Fluorescent Red	FM5CR06	FM5CR06B
5 µm	Level 7	Carboxylated Multiplex Fluorescent Red	FM5CR07	FM5CR07B
5 µm	Level 8	Carboxylated Multiplex Fluorescent Red	FM5CR08	FM5CR08B
5 µm	Level 9	Carboxylated Multiplex Fluorescent Red	FM5CR09	FM5CR09B
5 µm	Level 10	Carboxylated Multiplex Fluorescent Red	FM5CR10	FM5CR10B
5 µm	Level 11	Carboxylated Multiplex Fluorescent Red	FM5CR11	FM5CR11B
5 µm	Level 12 (high)	Carboxylated Multiplex Fluorescent Red	FM5CR12	FM5CR12B

Composition: Polystyrene particles containing encapsulated dyes  
 Dyes: Firefli fluorescent red  
 Concentration: 0.5% solids  
 Density: 1.05 g/cm<sup>3</sup>  
 Additives: 0.05% Tween 20 dispersant / Surfactant with 2mM sodium azide preservative



### Applications

- **Multiplex assay development**
- **Coupling to antibodies, nucleic acids and other biomolecules**

Cyto-Plex carboxylated beads provide 12 levels of fluorescent intensities at two distinct diameters for analysis of up to 24 different analytes from a single sample.

The use of a single diameter bead for all dye levels saves time by requiring the development and optimization of a single bead chemistry. Multiple diameters can be combined to increase the number of analytes measured in one test

- Carboxylate-modified bead provides high-density binding sites and low non-specific binding
- Beads are excited with 488 nm or 633 nm lasers, and have a maximum emission of 700 nm which can be collected in PE-Cy5 or APC channels. Since there is little or no emission in the FITC and PE channels, probes utilizing either of these dyes can be effectively used as reporters.
- Beads have little or no emission in the FITC and PE channels, enabling probes that utilize either dye to be used as reporters.

# Dyed Beads



# Sharp visibility and contrast

## Optimizes assay development

Develop high quality, highly sensitive Point of Care diagnostic assays with Thermo Scientific Color-Rich™ dyed beads. Our internal dyeing methods provide exceptional color saturation, prevent dye leaching in aqueous media, leave the surface free for covalent coupling, and enable maximum immunological reactivity. Available visible dyes include Green, Red and Blue for the Color-Rich Dyed Carboxylate-modified beads; and Red and Black for the ChromoSphere Dry Dyed beads for specialized applications.



### Applications

- Lateral flow and slide agglutination tests: Color-Rich Dyed Beads are ideal for rapid diagnostic and membrane-based assays
- Process testing: Chromosphere dry beads test the effectiveness of vial washers, filtration media, count protocols

Common Features	Benefits
Dye is incorporated internally throughout the polymer	Provides dye-free surface for fast coupling, and prevents leaching for optimum stability
Brilliant blue, red and black (Color-Rich) and red and black (Chromosphere) dyes	Intense colors provide high contrast and visibility
Manufactured in our ISO 13485 and FDA-certified facilities	Superior quality and lot-to-lot reproducibility
Wide range of diameter sizes	Meets a large variety of assay and testing needs



Color-Rich beads are internally dyed to prevent dye leaching while providing optimal color and brilliance, and a dye-free surface for coupling.

[See available Dyed Beads on the following pages...](#)

# Dyed Beads

## Color Rich Dyed Carboxylate-modified

### Applications

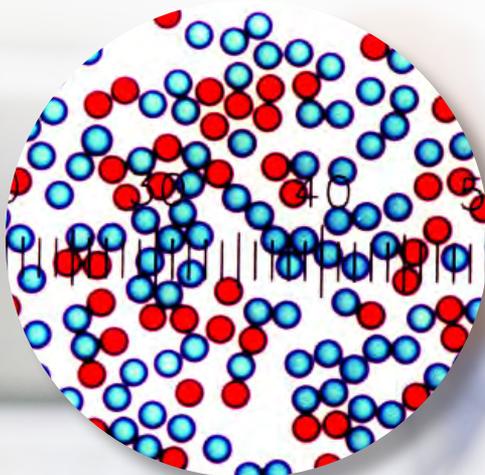
- Membrane-based lateral flow and slide agglutination tests
- Clinical diagnostics research and analysis
- Immuno/histological studies

Color-Rich dyed carboxylate-modified beads optimize assays by controlling sensitivity, specificity and stability. They are available in blue, red or black internally dyed versions that feature:

- Exceptional color and brilliance for high visibility and contrast
- Dye-free hydrophilic surface for covalent coupling of ligands
- Optimal immunological reactivity
- High protein binding capacity
- Optimized acid content

Nominal Diameter	Bottle Size	Color	% Solids	*Parking Area/Post Process	Catalog Number
0.3 µm	15 mL	Red	4%	80/0.01% Azide	DR1030CA
0.3 µm	15 mL	Black	4%	80/0.01% Azide	DBK1030CA
0.3 µm	100 mL	Red	4%	80/0.01% Azide	DR1030CB
0.3 µm	100 mL	Black	4%	80/0.01% Azide	DBK1030CB
0.4 µm	15 mL	Blue	4%	55/0.05% Azide	DB1040CA
0.4 µm	15 mL	Red	4%	55/0.05% Azide	DR1040CA
0.4 µm	15 mL	Black	4%	55/0.05% Azide	DBK1040CA
0.4 µm	100 mL	Blue	4%	55/0.05% Azide	DB1040CB
0.4 µm	100 mL	Red	4%	55/0.05% Azide	DR1040CB
0.4 µm	100 mL	Black	4%	55/0.05% Azide	DBK1040CB
0.85 µm	15 mL	Blue	2.5%	100/0.05% Azide	9310-1891-020250
0.85 µm	100 mL	Blue	2.5%	100/0.05% Azide	9310-1891-020350
0.85 µm	1000 mL	Blue	2.5%	100/0.05% Azide	9310-1891-020450

Composition: Polystyrene or polystyrene with copolymer grafted surface  
Surface Functionalities: Carboxylate-modified  
Dyes: Blue, red, black  
Uniformity: < 5% CV  
Density: 1.05 g/cm<sup>3</sup>  
Additives: 0.85 µm: Azide, 0.4 µm: None



\*Parking area is defined as the average area in Å<sup>2</sup> (square Angstroms, where 1 Angstrom = 10<sup>-8</sup> cm) on the bead surface which contains one carboxyl group (if the carboxyl groups are divided evenly).

## ChromoSphere Dyed (Dry)

Nominal Diameter	Bottle Size	Approximate Count per gram	Color (Dry)	Catalog Number
Dry Dyed Beads, Calibrated by Optical Microscopy				
50 µm	1 gram	$1.6 \times 10^7$	Red	RD050
50 µm	1 gram	$1.5 \times 10^7$	Black	BK050
100 µm	1 gram	$2.2 \times 10^6$	Red	RD100
100 µm	1 gram	$2.1 \times 10^6$	Black	BK100
150 µm	1 gram	$5.5 \times 10^5$	Red	RD150
150 µm	1 gram	$5.6 \times 10^5$	Black	BK150
200 µm	1 gram	$2.2 \times 10^5$	Red	RD200
200 µm	1 gram	$2.3 \times 10^5$	Black	BK200
300 µm	1 gram	$6.6 \times 10^4$	Red	RD300
300 µm	1 gram	$6.6 \times 10^4$	Black	BK300
400 µm	1 gram	$2.8 \times 10^4$	Red	RD400
400 µm	1 gram	$2.8 \times 10^4$	Black	BK400
500 µm	1 gram	$1.4 \times 10^4$	Red	RD500
500 µm	1 gram	$1.4 \times 10^4$	Black	BK500

Composition: Polystyrene divinylbenzene (PS-DVB)  
 Density: 1.06 g/cm<sup>3</sup>  
 % Solids: 100%  
 Additives: None

### Applications

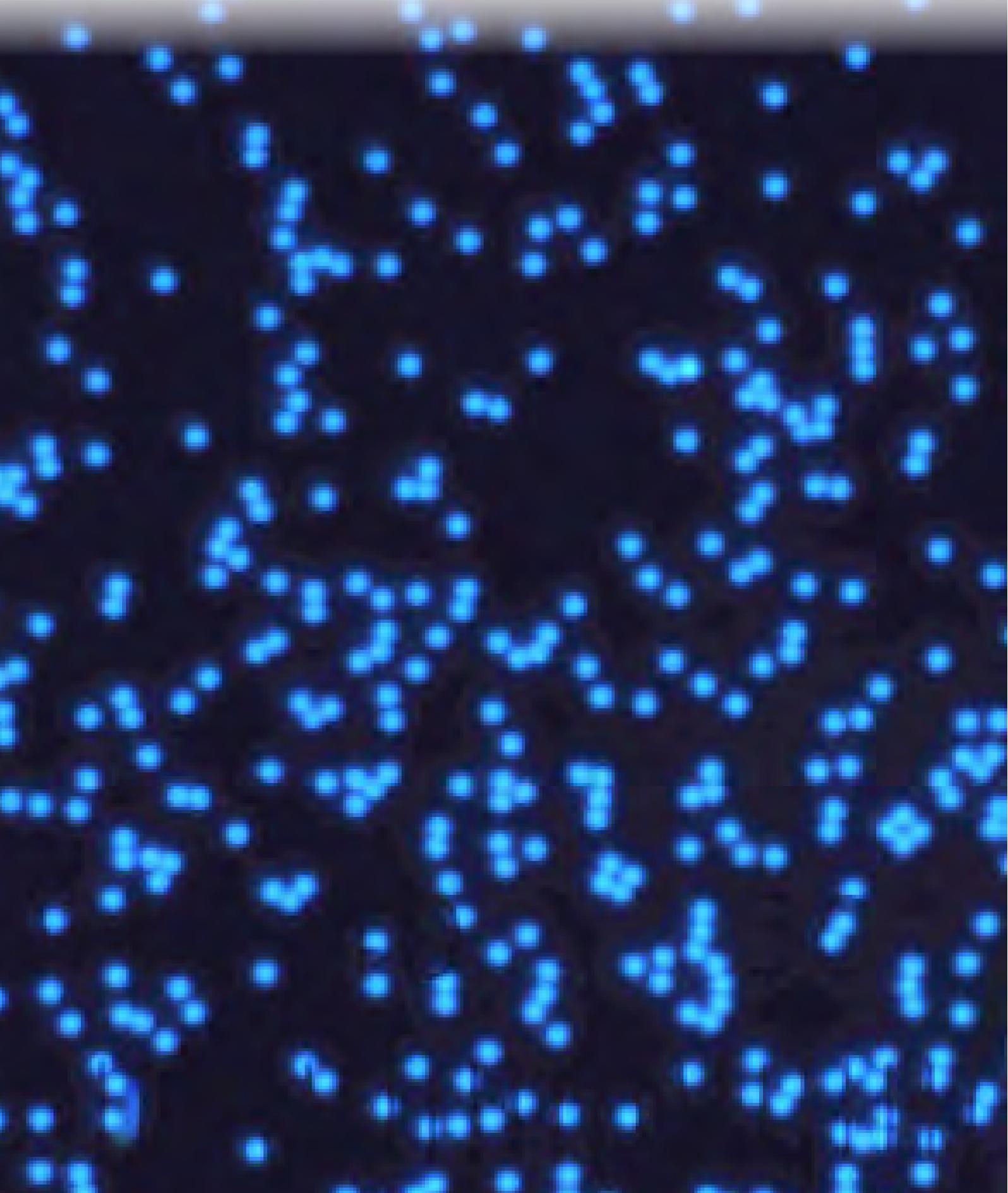
- Testing the effectiveness of vial washing and container cleaning systems
- Checking the effectiveness of filtration media
- Count validation protocols

ChromoSphere dry polymer beads are internally and deeply dyed with intense red or black dyes that provide very high contrast and visibility relative to most background materials.

- Easily suspendable in aqueous media with the aid of a small amount of surfactant, or in lower alcohols such as methanol or ethanol



# Fluorescent Beads



# Highest sensitivity

## Brilliant fluorescence

Sensitivity matters when developing lateral flow fluorescence-based tests, as well as tests for contamination control, flow tracing, filter screening, pore size evaluation, and flow dynamics. To obtain assays and tests with high sensitivity, stability and accuracy, we offer a wide range of functional Thermo Scientific Fluoro-Max™ fluorescent beads that come internally dyed to ensure maximum color brilliance and color saturation.



### Applications

- Lateral flow tests: Europium Chelate beads in either streptavidin-coated or carboxylate-modified versions
- Process monitoring: contamination control, flow tracing, filter testing, pore size evaluation, flow dynamics
- Calibration and QC: Microscopes
- Research: Nucleic acid hybridization, immuno/histological studies

Common Features	Benefits
Dye is incorporated internally throughout the polymer	Prevents leaching for optimum stability
Brilliant color fluorescence	Intense colors provide high contrast and visibility
Manufactured in our ISO 13485 and FDA-certified facilities	Superior quality and lot-to-lot reproducibility



Fluoro-Max fluorescent beads are internally dyed to prevent dye leaching while providing optimal color and brilliance, and a dye-free surface for coupling.

[See available Fluorescent Beads on the following pages...](#)

# Fluorescent Beads

## Fluoro-Max Europium Chelate (-COOH)

### Applications

- Lateral flow Point-of-Care tests
- Nucleic acid hybridization
- Immunohistological staining

Fluoro-Max fluorescent carboxylate-modified beads are internally dyed with europium chelate. This results in no dye leaching and a very broad Stokes Shift so that any non-specific fluorescent interference can be avoided.

When these beads excite at 333 nm and emit at 613 nm, they do so with a very long lifetime of approximately 0.5 milliseconds. In fact, this is about 10,000 to 100,000 times the lifetime of most fluorophores.

In addition, they

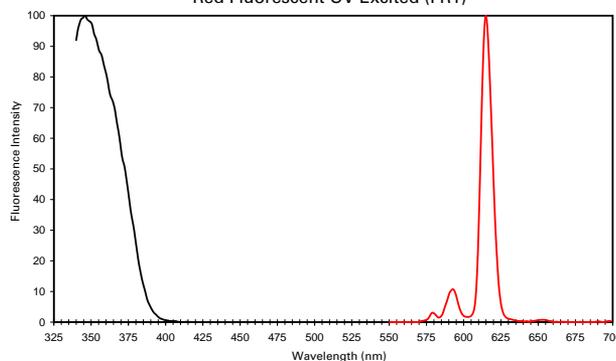
- Lower the detection limits of fluorescent assays severalfold
- Eliminate background interference from relatively short-lived matrix fluorescence
- Ensure maximum surface immunoreactivity

Nominal Diameter	Bottle Size	% Solids	Binding Capacity	Type/ Parking Area/ Post Process	Catalog Number
<i>Packaged in 1 mL, 5 mL, 100 ml. 1% solids, 10 mg/mL</i>					
0.1 µm	1 mL	1%	High	Europium Chelate/PA50/0.05% Azide	9347-0350-011150
0.1 µm	5 mL	1%	High	Europium Chelate/PA50/0.05% Azide	9347-0350-010150
0.1 µm	100 mL	1%	High	Europium Chelate/PA50/0.05% Azide	9347-0350-010350
0.2 µm	1 mL	1%	High	Europium Chelate/PA20/0.05% Azide	9347-0520-011150
0.2 µm	5 mL	1%	High	Europium Chelate/PA20/0.05% Azide	9347-0520-010150
0.2 µm	100 mL	1%	High	Europium Chelate/PA20/0.05% Azide	9347-0520-010350
0.3 µm	1 mL	1%	High	Europium Chelate/PA20/0.05% Azide	9347-0720-011150
0.3 µm	5 mL	1%	High	Europium Chelate/PA20/0.05% Azide	9347-0720-010150
0.3 µm	100 mL	1%	High	Europium Chelate/PA20/0.05% Azide	9347-0720-010350

Sample Kit		
Package Size	Included beads*	Catalog Number
3 x 1 mL	9347-0350-011150 (0.1 µm)	S9347
	9347-0520-011150 (0.2 µm)	
	9347-0720-011150 (0.3 µm)	

### Broad Stokes Shift

Red Fluorescent UV Excited (FR1)



When excited with UV light at its maximal absorbance wavelength of 333 nm, europium chelate beads emit long lived fluorescence at 613 nm, creating significant distance between the two peaks for optimal performance.

## Fluoro-Max Europium Streptavidin

Featuring many of the performance characteristics of Fluoro-Max fluorescent europium chelate beads, these beads address applications requiring a Streptavidin-coated surface.

Nominal Diameter	Bottle Size	% Solids	Binding Capacity	Type/ Parking Area/ Post Process	Catalog Number
<i>Packaged in 1 mL, 5 mL, 100 ml. 1% solids, 10 mg/mL</i>					
0.3 µm	1 mL	1%	Low	Europium Streptavidin/0.05% Azide	2947-0701-011150
0.3 µm	5 mL	1%	Low	Europium Streptavidin/0.05% Azide	2947-0701-010150

# Fluorescent Beads

## Fluoro-Max Green, Red (Dry)

Nominal Diameter	CV% Size Uniformity	Bottle Size	Color	Catalog Number
Dry Calibrated by Optical Microscopy				
5 µm	< 18%	1 g	Green	35-2
5 µm	< 18%	5 g	Green	35-2B
10 µm	< 18%	1 g	Green	35-3
10 µm	< 18%	5 g	Green	35-3B
15 µm	< 12%	1 g	Green	35-4
15 µm	< 12%	5 g	Green	35-4B
25 µm	< 12%	1 g	Green	35-5
25 µm	< 12%	5 g	Green	35-5B
30 µm	< 13%	1 g	Green	35-6
30 µm	< 13%	5 g	Green	35-6B
40 µm	< 9%	1 g	Green	35-7
40 µm	< 9%	5 g	Green	35-7B
50 µm	< 12%	1 g	Green	35-8
50 µm	< 12%	5 g	Green	35-8B
70 µm	< 7%	1 g	Green	35-9
70 µm	< 7%	5 g	Green	35-9B
80 µm	< 6%	1 g	Green	35-10
80 µm	< 6%	5 g	Green	35-10B
100 µm	< 7%	1 g	Green	35-11
100 µm	< 7%	5 g	Green	35-11B
120 µm	< 6%	1 g	Green	35-12
120 µm	< 6%	5 g	Green	35-12B
140 µm	< 6%	1 g	Green	35-13
140 µm	< 6%	5 g	Green	35-13B
160 µm	< 5%	1 g	Green	35-14
160 µm	< 5%	5 g	Green	35-14B
5 µm	< 18%	1 g	Red	36-2
5 µm	< 18%	5 g	Red	36-2B
10 µm	< 18%	1 g	Red	36-3
10 µm	< 18%	5 g	Red	36-3B
15 µm	< 14%	1 g	Red	36-4
15 µm	< 14%	5 g	Red	36-4B
25 µm	< 12%	1 g	Red	36-5
25 µm	< 12%	5 g	Red	36-5B
30 µm	< 11%	1 g	Red	36-6
30 µm	< 11%	5 g	Red	36-6B
100 µm	< 7%	1 g	Red	36-11
100 µm	< 7%	5 g	Red	36-11B

Composition: Polystyrene  
 Dyes: Green (468/508 nm), Red (542/612 nm)  
 Density: 1.05 g/cm<sup>3</sup>  
 Index of Refraction: 1.59 @ 589 nm (25°C)  
 % Solids: 100%

### Applications

- Optimize the analytical performance of conventional microscopes
- Qualitative and quantitative contamination control
- Flow tracing, filter testing, and pore size evaluations

Fluoro-Max green and red dry beads, produce bright, exceptional colors that stand out against background materials. In addition, they:

- Provide superior test sensitivity in qualitative and quantitative contamination control tests
- Are internally dyed for optimal stability and to prevent leaching in aqueous media
- Can be detected using an epifluorescence or confocal microscope, a fluorometer, fluorescence spectrophotometer, flow cytometer, or by mineral or UV/black light.

# Fluorescent Beads

## Fluoro-Max Green, Red, Blue (Aqueous)

### Applications

- **Optimize the analytical performance of conventional microscopes**
- **Qualitative and quantitative contamination control**
- **Flow tracing, filter testing, and pore size evaluations**

Fluoro-Max fluorescent green, red and blue aqueous beads produce bright, exceptional colors that stand out against background materials. In addition, they:

- Provide superior test sensitivity in qualitative and quantitative contamination control tests
- Are internally dyed for optimal stability and to prevent leaching in aqueous media
- Can be detected using an epifluorescence or confocal microscope, a fluorometer, fluorescence spectrophotometer, flow cytometer, or by mineral or UV/black light.

Composition:	Polystyrene
Dyes*	Green (468/508 nm) Red (542/612 nm), Blue (365/447, 412/473 nm)
Density:	1.05 g/cm <sup>3</sup>
Index of Refraction:	1.59 @ 589 nm (25°C)
Additives:	Contains trace amount of surfactant
% Solids	1%

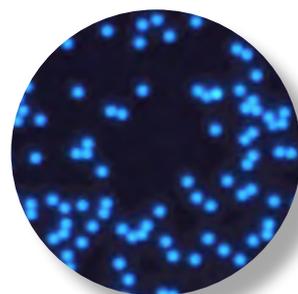
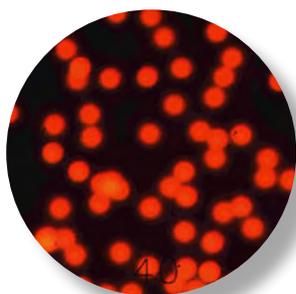
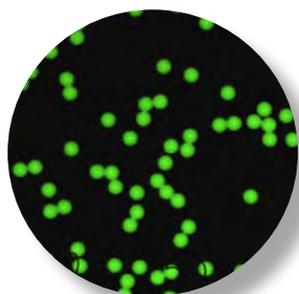
Nominal Diameter	Bottle Size	Green Color	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy, 1% Solids			
0.03 µm	15 mL	Green	G25
0.03 µm	90 mL	Green	G25B
0.04 µm	15 mL	Green	G40
0.04 µm	90 mL	Green	G40B
0.05 µm	15 mL	Green	G50
0.05 µm	90 mL	Green	G50B
0.07 µm	15 mL	Green	G75
0.07 µm	90 mL	Green	G75B
0.09 µm	15 mL	Green	G85
0.09 µm	90 mL	Green	G85B
0.10 µm	15 mL	Green	G100
0.10 µm	90 mL	Green	G100B
0.14 µm	15 mL	Green	G140
0.14 µm	90 mL	Green	G140B
0.20 µm	15 mL	Green	G200
0.20 µm	90 mL	Green	G200B
0.25 µm	15 mL	Green	G250
0.25 µm	90 mL	Green	G250B
0.30 µm	15 mL	Green	G300
0.30 µm	90 mL	Green	G300B
0.40 µm	15 mL	Green	G400
0.40 µm	90 mL	Green	G400B
0.45 µm	15 mL	Green	G450
0.45 µm	90 mL	Green	G450B
0.50 µm	15 mL	Green	G500
0.50 µm	90 mL	Green	G500B
0.60 µm	15 mL	Green	G600
0.60 µm	90 mL	Green	G600B
0.70 µm	15 mL	Green	G700
0.70 µm	90 mL	Green	G700B
0.83 µm	15 mL	Green	G830
0.83 µm	90 mL	Green	G830B
0.90 µm	15 mL	Green	G900
0.90 µm	90 mL	Green	G900B
1 µm	10 mL	Green	G0100
1 µm	60 mL	Green	G0100B
2 µm	10 mL	Green	G0200
2 µm	60 mL	Green	G0200B
2 µm	10 mL	Green	G0220
2 µm	60 mL	Green	G0220B
3 µm	10 mL	Green	G0300
3 µm	60 mL	Green	G0300B
5 µm	10 mL	Green	G0500
5 µm	60 mL	Green	G0500B
10 µm	10 mL	Green	G1000
10 µm	60 mL	Green	G1000B

# Fluorescent Beads

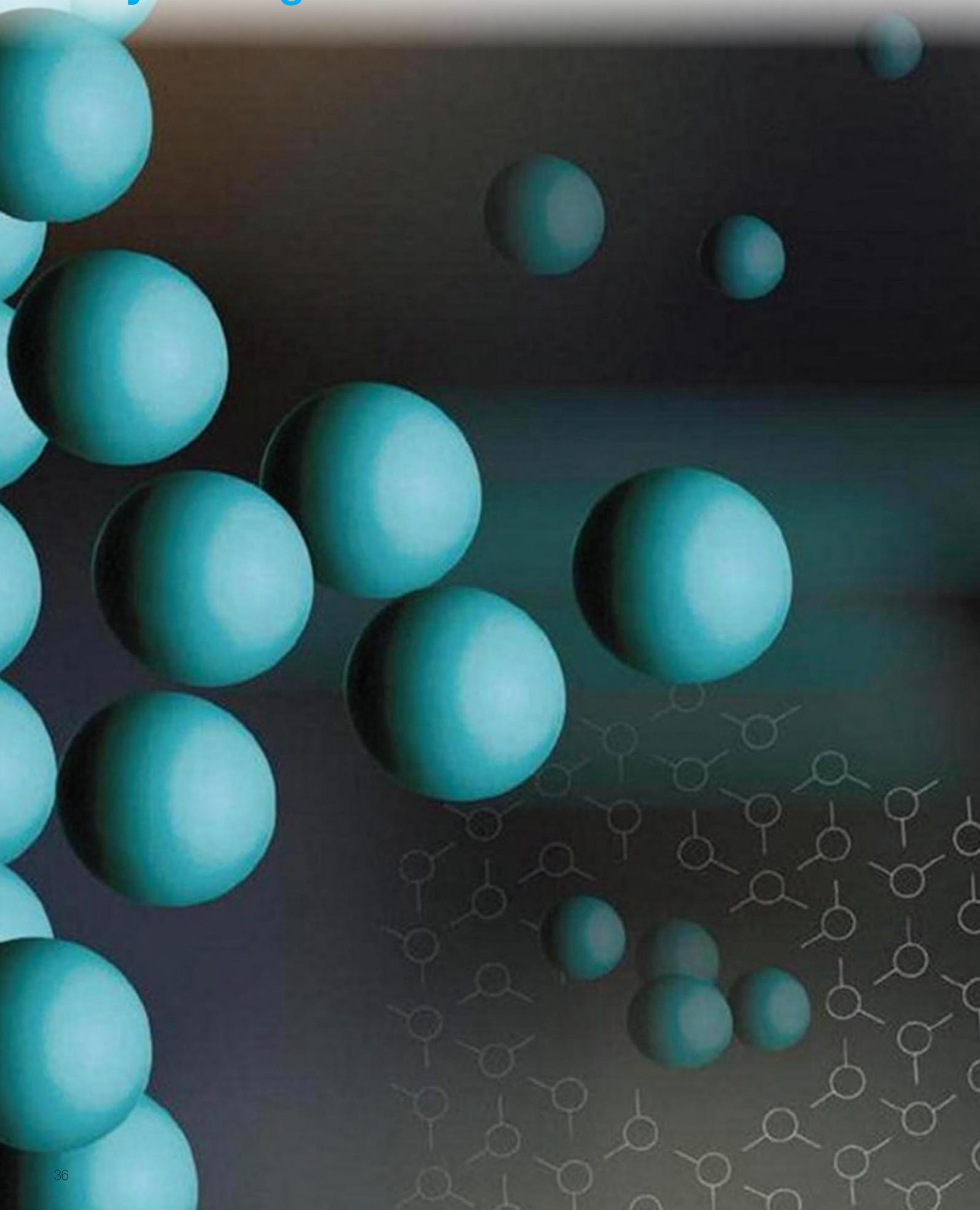
## Fluoro-Max Green, Red, Blue (Aqueous)

Nominal Diameter	Bottle Size	Red Color	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy, 1% Solids			
0.03 µm	15 mL	Red	R25
0.03 µm	90 mL	Red	R25B
0.05 µm	15 mL	Red	R50
0.05 µm	90 mL	Red	R50B
0.06 µm	15 mL	Red	R60
0.06 µm	90 mL	Red	R60B
0.10 µm	15 mL	Red	R100
0.10 µm	90 mL	Red	R100B
0.16 µm	15 mL	Red	R160
0.16 µm	90 mL	Red	R160B
0.20 µm	15 mL	Red	R200
0.20 µm	90 mL	Red	R200B
0.30 µm	15 mL	Red	R300
0.30 µm	90 mL	Red	R300B
0.40 µm	15 mL	Red	R400
0.40 µm	90 mL	Red	R400B
0.50 µm	15 mL	Red	R500
0.50 µm	90 mL	Red	R500B
0.60 µm	15 mL	Red	R600
0.60 µm	90 mL	Red	R600B
0.70 µm	15 mL	Red	R700
0.70 µm	90 mL	Red	R700B
0.80 µm	15 mL	Red	R800
0.80 µm	90 mL	Red	R800B
0.90 µm	15 mL	Red	R900
0.90 µm	90 mL	Red	R900B
1 µm	10 mL	Red	R0100
1 µm	60 mL	Red	R0100B
2 µm	10 mL	Red	R0200
2 µm	60 mL	Red	R0200B
3 µm	10 mL	Red	R0300
3 µm	60 mL	Red	R0300B

Nominal Diameter	Bottle Size	Blue Color	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy, 1% Solids			
0.05 µm	15 mL	Blue	B50
0.05 µm	90 mL	Blue	B50B
0.10 µm	15 mL	Blue	B100
0.10 µm	90 mL	Blue	B100B
0.15 µm	15 mL	Blue	B150
0.15 µm	90 mL	Blue	B150B
0.20 µm	15 mL	Blue	B200
0.20 µm	90 mL	Blue	B200B
0.30 µm	15 mL	Blue	B300
0.30 µm	90 mL	Blue	B300B
0.40 µm	15 mL	Blue	B400
0.40 µm	90 mL	Blue	B400B
0.50 µm	15 mL	Blue	B500
0.50 µm	90 mL	Blue	B500B
0.52 µm	15 mL	Blue	B520
0.52 µm	90 mL	Blue	B520B
0.60 µm	15 mL	Blue	B600
0.60 µm	90 mL	Blue	B600B
0.70 µm	15 mL	Blue	B700
0.70 µm	90 mL	Blue	B700B
0.80 µm	15 mL	Blue	B800
0.80 µm	90 mL	Blue	B800B
0.90 µm	15 mL	Blue	B900
0.90 µm	90 mL	Blue	B900B
1 µm	10 mL	Blue	B0100
1 µm	60 mL	Blue	B0100B
2 µm	10 mL	Blue	B0200
2 µm	60 mL	Blue	B0200B



# Undyed Diagnostic Beads



# High affinity, high binding capacity

## Ideal for covalent coupling

Optimize assays for clinical diagnostic applications with Thermo Scientific Opti-Bind™ sulfate and Thermo Scientific Opti-Link™ carboxylate-modified beads. In addition to meeting the sensitivity, specificity and stability requirements of the industry, these beads come with a variety of surface chemistries to ensure quick adsorbing of proteins. Our Thermo Scientific PowerBind™ streptavidin polymer beads provide an easy way to bind biotinylated, solid-phase ligands.



### Applications

- Clinical diagnostics: turbidimetric assays and slide agglutination
- Research: Nucleic acid studies

Common Features	Benefits
Proprietary anionic surfactant	Does not interfere with the binding of proteins nor cause proteins to desorb from bead surfaces
No common surfactants used (SDS, Tween 20, Triton X-100, etc.)	Optimizes protein binding to bead surface
Available with variety of surface chemistries	Accommodates a wide range of coupling strategies
Packaged in convenient, ready-to-use bottles	Eliminates pre-washing for most applications

See available Undyed Diagnostic Beads on the following pages...

# Undyed Diagnostic Beads

## Opti-Link Carboxylate-modified Beads

### Applications

- **Covalent coupling of proteins**

Opti-Link carboxylate-modified beads contain carboxylic acid groups for covalent coupling and can be used in a variety of molecular biology and clinical diagnostic applications.

The various acid content of the Opti-Link product line enables control of sensitivity, specificity and stability. Particle size combines surface area and acid content to provide the surface acid distribution that is most useful for assay optimization.

- Proprietary anionic surfactant does not interfere with the binding of proteins, nor cause any desorbing of proteins from the surface of the bead
- Variety of available surface chemistries accommodates a wide range of coupling strategies
- Can be used directly from the bottle without any pre-washing for most applications for convenience and ease-of-use

Nominal Diameter	Bottle Size (100 mg/mL)	% Solids	Surface Acid Loading/ Post Process	Catalog Number
0.04 µm	15 mL	4%	Low Acid/Azide	W004CA
0.04 µm	100 mL	4%	Low Acid/Azide	W004CB
0.2 µm	15 mL	10%	Low Acid/Pasteurized	9300-0570-100290
0.2 µm	100 mL	10%	Low Acid/Pasteurized	9300-0570-100390
0.2 µm	15 mL	10%	Medium Acid/Pasteurized	8300-0550-100290
0.2 µm	100 mL	10%	Medium Acid/Pasteurized	8300-0550-100390
0.2 µm	15 mL	10%	High Acid/Pasteurized	8300-0520-100290
0.2 µm	100 mL	10%	High Acid/Pasteurized	8300-0520-100390
0.3 µm	15 mL	10%	Medium Acid/Pasteurized	8300-0750-100290
0.3 µm	100 mL	10%	Medium Acid/Pasteurized	8300-0750-100390
0.3 µm	15 mL	10%	High Acid/Pasteurized	8300-0720-100290
0.3 µm	100 mL	10%	High Acid/Pasteurized	8300-0720-100390
0.4 µm	15 mL	10%	Low Acid/Pasteurized	8300-0970-100290
0.4 µm	100 mL	10%	Low Acid/Pasteurized	8300-0970-100390
0.4 µm	15 mL	10%	High Acid/Pasteurized	8300-0920-100290
0.4 µm	100 mL	10%	High Acid/Pasteurized	8300-0920-100390
0.5 µm	15 mL	4%	Medium Acid/Azide	W050CA
0.5 µm	100 mL	4%	Medium Acid/Azide	W050CB
0.85 µm	15 mL	4%	Medium Acid/Azide	W080CA
0.85 µm	100 mL	4%	Medium Acid/Azide	W080CB
0.85 µm	15 mL	10%	Low Acid/Pasteurized	9300-1891-100290
0.85 µm	100 mL	10%	Low Acid/Pasteurized	9300-1891-100390
0.9 µm	15 mL	4%	High Acid/Azide	W090CA
0.9 µm	100 mL	4%	High Acid/Azide	W090CB
2.0 µm	15 mL	10%	PA5, High Acid	7300-3305-100250
2.0 µm	100 mL	10%	PA5, High Acid	7300-3305-100350
3.0 µm	15 mL	10%	PA20, High Acid	7300-3420-100250
3.0 µm	100 mL	10%	PA20, High Acid	7300-3420-100350
4.0 µm	15 mL	4%	High Acid/Azide	W400CA
4.0 µm	100 mL	4%	High Acid/Azide	W400CB
5.0 µm	15 mL	4%	High Acid/Azide	W500CA
5.0 µm	100 mL	4%	High Acid/Azide	W500CB

# Undyed Diagnostic Beads

## Opti-Bind Sulfate Beads

Nominal Diameter	Bottle Size (100 mg/mL)	% Solids	Surface Acid Loading/ Post Process	Catalog Number
0.1 µm	15 mL	10%	Low SO4/Pasteurized	8100-0397-100290
0.1 µm	100 mL	10%	Low SO4/Pasteurized	8100-0397-100390
0.2 µm	15 mL	10%	Low SO4/Pasteurized	8100-0597-100290
0.2 µm	100 mL	10%	Low SO4/Pasteurized	8100-0597-100390
0.3 µm	15 mL	10%	Low SO4/Pasteurized	8100-0797-100290
0.3 µm	100 mL	10%	Low SO4/Pasteurized	8100-0797-100390
0.4 µm	15 mL	10%	Low SO4/Pasteurized	8100-0997-100290
0.4 µm	100 mL	10%	Low SO4/Pasteurized	8100-0997-100390
0.6 µm	15 mL	10%	Low SO4/Pasteurized	9100-1397-100290
0.6 µm	100 mL	10%	Low SO4/Pasteurized	9100-1397-100390
0.85 µm	15 mL	10%	Low SO4/Pasteurized	9100-1897-100290
0.85 µm	100 mL	10%	Low SO4/Pasteurized	9100-1897-100390
1.25 µm	15 mL	10%	Low SO4/0.05% Azide	7100-2697-100250
1.25 µm	100 mL	10%	Low SO4/0.05% Azide	7100-2697-100350
2.5 µm	15 mL	10%	Low SO4/0.05% Azide	7100-3497-100250
2.5 µm	100 mL	10%	Low SO4/0.05% Azide	7100-3497-100350

### Applications

- Turbidimetric assays
- Slide agglutination tests

With its hydrophobic sulfate surface that adsorbs proteins almost instantaneously, Opti-Bind beads provide maximum reactivity in turbidimetric assays and many diagnostic applications.

- Proprietary anionic surfactant does not interfere with the binding of proteins, nor cause any desorbing of proteins from the surface of the bead
- Variety of available surface chemistries accommodates a wide range of coupling strategies
- Can be used directly from the bottle without any pre-washing

## Power-Bind Streptavidin-coated

Nominal Diameter	Bottle Size	% Solids	Binding Capacity	Catalog Number
0.3 µm	1 mL	1%	~1000 pmol/mg	2900-0701-011150
0.3 µm	5 mL	1%	~1000 pmol/mg	2900-0701-010150
0.3 µm	100 mL	1%	~1000 pmol/mg	2900-0701-010350
0.85 µm	1 mL	1%	~1000 pmol/mg	2900-1801-011150
0.85 µm	5 mL	1%	~1000 pmol/mg	2900-1801-010150
0.85 µm	100 mL	1%	~1000 pmol/mg	2900-1801-010350

Composition: Polystyrene  
 Density: 1.05 g/cm<sup>3</sup>  
 Refractive Index: 1.59 @ 589 nm (25° C)  
 Additives: Trace surfactant to inhibit agglomeration

### Applications

- Clinical diagnostic kit development
- Nucleic acid research

These non-magnetic streptavidin-coated beads improve and simplify the binding of solid-phase ligands to beads by providing a high surface area and a high affinity/high specific biotin binding capacity.

- Biotinylated compounds easily bind with utmost stability to the beads after simple incubation in buffer.
- The covalently-bound streptavidin also functions as a spacer, which improves the specific activity of the bound ligand
- Available as monodisperse suspensions, the beads have a dissociation constant of  $K_d$  10<sup>-15</sup> Molar, low non-specific interactions, high activity of surface-bound ligands, and a long shelf-life

# Specialty Beads



# Very precise and accurate

## For research and industrial needs

For specialty applications where precision, accuracy and uniformity matter, we offer a variety of unique beads including particulate marker fluorescent beads for heart studies, and our 5000 and 7000 Series beads for analyzing particulate materials that come in various sizes. Thermo Scientific Smoke Check™ beads are specifically designed for checking smoke detectors, while Thermo Scientific HEPA-Check™ beads are used to test high efficiency particulate air and in-situ filters.



### Medical Research Applications

#### Particulate Markers

- Myocardial infarction studies: fluorescent beads for placement in “risk zone” of heart

### Smoke Detector and Filter Testing Applications

#### Smoke-Check Challenge Beads

- Monitors the transport time of air sampling smoke detectors

#### HEPA-Check Beads

- Tests the effectiveness of HEPA and in-situ filters

### Research and Filter Evaluation Applications

#### 5000 Series Polymer Bead Suspensions

- Available in 0.03  $\mu\text{m}$  to 3.2  $\mu\text{m}$  sizes, these beads are used in the analysis of particulate matter of various sizes
- Ideal for filter checking, testing and evaluation, light scattering research, fluid mechanics research, aerosol particle generation, dispersion studies and other R&D projects

#### 7000 Series Co-polymer Bead Suspensions

- Like the 5000 Series, these beads are used in the analysis of particulate matter of various sizes. The difference is that they come in larger sizes from 3.2  $\mu\text{m}$  to 222  $\mu\text{m}$ .
- Ideal for use as model systems for fluid mechanics research and as challenge beads for large pore filtration systems.

[See available Specialty Beads on the following pages...](#)

# Specialty Beads

## Fluoro-Max Particulate Markers

### Applications

- **Myocardial infarction studies (analysis of heart attacks)**
- **Evaluation of regional ischemia**

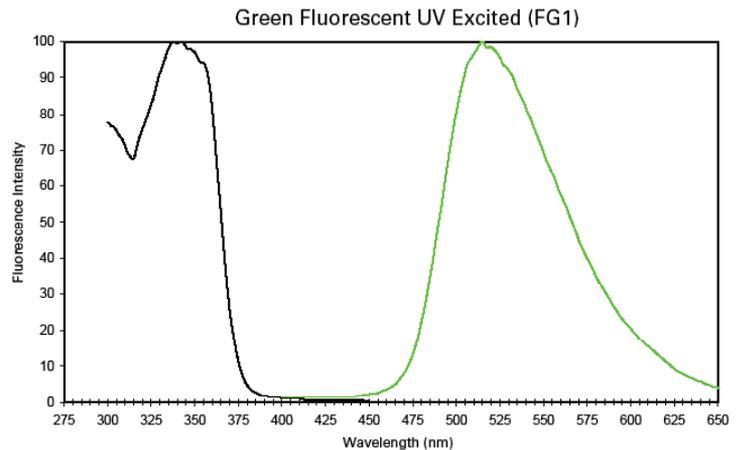
Fluoro-Max Particulate Marker beads are used for lodging in the capillaries or "risk zone" from which a heart attack can be triggered.

- These fluorescent dyed beads emit highly visible, brilliant and detectable yellow-green color when subjected to a hand held UV or black light lamp
- In white light conditions, the beads remain "invisible" which allows the non-risk tissue to be examined for infarction
- Beads are internally dyed to prevent leaching, cause indiscriminate staining, and to ensure stability and strong performance

Nominal Diameter	Bottle Size	Fluorescent Color	% Solids	Catalog Number
Aqueous Suspensions, Calibrated by Optical Microscopy				
1 - 10 $\mu\text{m}$	1 gram	Firefli Fluorescent Green UV (Dry)	1%	34-1
1 - 10 $\mu\text{m}$	5 grams	Firefli Fluorescent Green UV (Dry)	1%	34-1B

Composition: Polystyrene divinylbenzene (PS-DVB)  
Dyes: Firefli fluorescent green UV (360/530 nm)  
Density: 1.05 g/cm<sup>3</sup>  
Additives: Contains trace amount of dispersant

**Spectral information is approximate and for reference only. The spectral properties of the dye are dependent on their concentration and physical environment. The exact excitation and emission maxima may vary depending on the size and composition of the particles.**



# Specialty Beads

## Smoke-Check Challenge Beads

Bottle Size	% Solids	Description	Catalog Number
10 mL	5%	Smoke Detector Challenge Beads	SD-01

Composition: Polystyrene  
 Density: 1.05 g/cm<sup>3</sup>  
 Refractive Index: 1.59 @ 589 nm (25° C)  
 Additives: Trace surfactant to inhibit agglomeration



### Applications

- **Monitor the transport time of air sampling smoke detectors\***

Smoke-Check beads are nebulized using a handheld ultrasonic atomizer to mimic natural smoke, and then introduced to the smoke detector to trigger its alarm.

- Oil-free beads eliminate the need to use potentially hazardous oil-based sprays and real smoke
- Bead size and concentration is optimized to consistently trigger the smoke detector
- Beads will not pass through HEPA filters, ensuring the integrity of a cleanroom and other critical environments

\*as required by the United States National Fire Protection Agency Standard 72d

## HEPA-Check Filter Challenge Beads

Nominal Diameter	Catalog Number		
	Bottle	Pack (6)	Box (20)
0.12 µm	HF12	HF12-PK	HF12-BX
0.14 µm	HF14	HF14-PK	HF14-BX
0.17 µm	HF17	HF17-PK	HF17-BX
0.20 µm	HF20	HF20-PK	HF20-BX
0.22 µm	HF22	HF22-PK	HF22-BX
0.26 µm	HF26	HF26-PK	HF26-BX
0.30 µm	HF30	HF30-PK	HF30-BX

Composition: Polystyrene  
 Concentration: 7.5 x 10<sup>12</sup> beads / mL  
 Density: 1.05 g/cm<sup>3</sup>  
 Refractive Index: 1.59 @ 589 nm (25° C)  
 Additives: Trace surfactant to inhibit agglomeration  
 Size uniformity: ≤ 5%

### Applications

- **HEPA (High Efficiency Particulate Air) and ULPA (Ultra Low Penetration Air) filter testing**
- **Leak testing of in-situ filters**

HEPA-Check beads are aerosolized and then introduced to the filter to determine (using a particle counter) if they “leak” through.

- Oil-free beads eliminate the need to use potentially hazardous oil-based material like dioctylphthalate (DOP)
- Listed as suitable test material by Institute of Environmental Sciences (IEST) and European Norm (EN) standards.

# Specialty Beads

## 5000 Series Polymer Bead Suspensions

### Applications

- Filter evaluation, checking and testing
- Research: Light scattering, fluid mechanics, dispersion studies
- Aerosol particle generation

The 5000 Series beads are used in the analysis of particulate materials that come in a variety of sizes and have various properties.

- Bead diameters are measured by optical microscopy, photon correlation spectroscopy or light scattering to ensure accuracy.
- If larger beads are required, please refer to our 7000 Series copolymer bead suspensions

**Note:** Not intended for use in instrument calibration or diagnostic reagents.

Nominal Diameter	Size Uniformity	Bottle Size	% Solids	Catalog Number
Packaged as aqueous suspensions				
0.03 µm	≤ 30%	15 mL	10%	5003A
0.06 µm	≤ 18%	15 mL	10%	5006A
0.08 µm	≤ 18%	15 mL	10%	5008A
0.09 µm	≤ 15%	15 mL	10%	5009A
0.10 µm	≤ 15%	15 mL	10%	5010A
0.11 µm	≤ 12%	15 mL	10%	5011A
0.12 µm	≤ 12%	15 mL	10%	5012A
0.14 µm	≤ 6%	15 mL	10%	5014A
0.16 µm	≤ 6%	15 mL	10%	5016A
0.17 µm	≤ 5%	15 mL	10%	5017A
0.20 µm	≤ 5%	15 mL	10%	5020A
0.22 µm	≤ 3%	15 mL	10%	5022A
0.24 µm	≤ 3%	15 mL	10%	5024A
0.26 µm	≤ 3%	15 mL	10%	5026A
0.30 µm	≤ 3%	15 mL	10%	5030A
0.31 µm	≤ 3%	15 mL	10%	5031A
0.33 µm	≤ 3%	15 mL	10%	5033A
0.36 µm	≤ 3%	15 mL	10%	5036A
0.43 µm	≤ 3%	15 mL	10%	5043A
0.49 µm	≤ 3%	15 mL	10%	5049A
0.50 µm	≤ 3%	15 mL	10%	5050A
0.51 µm	≤ 3%	15 mL	10%	5051A
0.52 µm	≤ 3%	15 mL	10%	5052A
0.60 µm	≤ 3%	15 mL	10%	5060A
0.65 µm	≤ 3%	15 mL	10%	5065A
0.67 µm	≤ 3%	15 mL	10%	5067A
0.75 µm	≤ 3%	15 mL	10%	5074A
0.81 µm	≤ 3%	15 mL	10%	5081A
0.88 µm	≤ 3%	15 mL	10%	5088A
0.93 µm	≤ 3%	15 mL	10%	5093A
1.0 µm	≤ 3%	15 mL	10%	5100A
1.3 µm	≤ 5%	15 mL	10%	5130A
1.5 µm	≤ 4%	15 mL	10%	5153A
2.0 µm	≤ 4%	15 mL	10%	5200A
2.9 µm	≤ 5%	15 mL	10%	5300A
3.2 µm	≤ 5%	15 mL	10%	5320A

Composition: Polystyrene  
Density: 1.05 g/cm<sup>3</sup>  
Index of Refraction: 1.59 @ 589 nm (25°C)  
Additives: Contains trace amount of surfactant

**Note:** 15 mL ("A" bottles) listed are available for immediate purchase. 100 mL ("B" bottles) and 1000 mL ("C" bottles) are packaged to order; i.e., 5003B and 5003C.



## 7000 Series Co-polymer Bead Suspensions

Nominal Diameter	Size Uniformity	Bottle Size	% Solids	Catalog Number
Packaged as aqueous suspensions				
3.2 µm	≤ 45%	15 mL	10%	7503A
6.0 µm	≤ 25%	15 mL	10%	7505A
7.9 µm	≤ 20%	15 mL	10%	7508A
11 µm	≤ 18%	15 mL	10%	7510A
17 µm	≤ 16%	15 mL	10%	7516A
19 µm	≤ 16%	15 mL	10%	7520A
25 µm	≤ 15%	15 mL	10%	7525A
45 µm	≤ 15%	15 mL	10%	7545A
55 µm	≤ 16%	15 mL	10%	7550A
71 µm	≤ 15%	15 mL	10%	7575A
90 µm	≤ 16%	15 mL	10%	7590A
97 µm	≤ 12%	15 mL	10%	7602A
134 µm	≤ 16%	15 mL	10%	7640A
222 µm	≤ 12%	15 mL	10%	7725A

Composition: Polystyrene cross-linked with divinylbenzene (DVB)

Density: 1.05 g/cm<sup>3</sup>

Index of Refraction: 1.59 @ 589 nm (25°C)

Additives: Contains trace amount of surfactant

**Note:** 15 mL ("A" bottles) listed are available for immediate purchase. 100 mL ("B" bottles) and 1000 mL ("C" bottles) are packaged to order; i.e., 7503B and 7503C.

### Applications

- Filter evaluation, checking and testing
- Fluid mechanics research
- Dispersion studies
- Acoustical and optical analytical systems testing and analysis

The 7000 Series beads come in much larger sizes than our 5000 Series, with diameters that range from 3.2 µm to 222 µm. The larger size of the 7000 Series of copolymer beads makes them ideal for use as model systems when analyzing larger particulate material with various properties.

**Note:** Not intended for use in instrument calibration or diagnostic reagents.



# Particle Applications



# Solutions for your specific needs

## Custom and off-the-shelf

Engineers, physicists, chemists and scientists at the world's leading universities, research institutions and clinical diagnostic labs use Thermo Scientific beads for a wide variety of applications. As a trusted supplier to the scientific community with over 35 years of particle technology experience, we're ready to support you with powerful diagnostic, calibration and quality control solutions. If you have a specific need not found in this catalog, contact us to discuss at 1-800-232-3342 (USA) or 1-510-979-5000 (International), or [info.microparticles@thermofisher.com](mailto:info.microparticles@thermofisher.com)



### Proven Applications

- Immunoassay development
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- Flow cytometry instrument calibration / set-up
- Nucleic acid research
- Flow tracing
- Filter evaluation and testing
- Drug discovery and development
- ...and others

### Markets Served

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- Diagnostics
- Electronics
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- Food / Beverage
- Government
- Industrial
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- Pharmaceutical
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- Semiconductor
- Water / wastewater
- ...and more



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# Knowledgeable Service Technicians

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### [thermoscientific.com/particletechnology](https://thermoscientific.com/particletechnology)

- Visit our website for the most up-to-date, most complete information about our a wide of size standards, count controls, flow cytometry beads, dyed beads, fluorescent beads, diagnostic lab and specialty beads
- PDFs of product specifications sheets, technical notes, MSDS and other relevant items are available for download to your drive
- Detailed specifications, contact and ordering information are provided

### Literature

In addition to this Product Catalog, we offer literature with descriptive product information, detailed specifications sheets and technical applications data.

- **Product Flyers.** For information on a specific category of particle products, these provide a quick, at-a-glance overview.
- **Product Specifications.** For information on a specific particle product family or SKU, these provide a comprehensive specifications along with key features and benefits.
- **Technical Notes and Reference Guide.** This comprehensive brochure offer basic strategies, guidelines and procedures for using and applying beads of various types for your specific needs. You'll find ideas for coupling beads to proteins, sonication and mixing beads, and selecting the right bead surface property for diagnostic applications. You can learn more of the importance of mean diameter and uncertainty for effective instrument calibration, and get clarification on the differences of various types of flow cytometry beads. There's even a refresher on the basic ways for working with and handling beads.



# Customer Support

## Placing an Order

For faster service when placing an order, please provide the following information to our Customer Service Department:

- Your account number
- Your purchase order number
- Your contact name, phone number, email
- Requested delivery date
- Your “ship-to” address
- Shipping requirements (indicate any special requirements)
- Our part/catalog number (if known)
- Our part description
- Package size/unit of measure
- Quantity of packages
- Our quote number and price (if provided)
- Specification (if any)

Nominal diameters, surface acid content and binding capacities are listed in the product tables. Exact parameters and other technical information is listed on package inserts and certificates of analysis.

**Note:** Not all beads are available at all times. For product and lot availability, contact Customer Service at 1-800-232-3342 or [info.microparticles@thermofisher.com](mailto:info.microparticles@thermofisher.com).

Although we can manufacture up to 300 liter batch sizes, please advise us of your particle usage requirements so that we can confirm sufficient inventory quantities for your application.

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## Free Product Brochures, Spec Sheets, and Application Notes

For more details about any product, we offer a wide array of literature. Contact us at 1-800-232-3342, 1-510-979-5000, or by email at [info.microparticles@thermofisher.com](mailto:info.microparticles@thermofisher.com)

## Customer Service Department

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### Fax:

1-510-979-5498

### Hours:

7 a.m. - 5 p.m. Pacific Standard Time

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