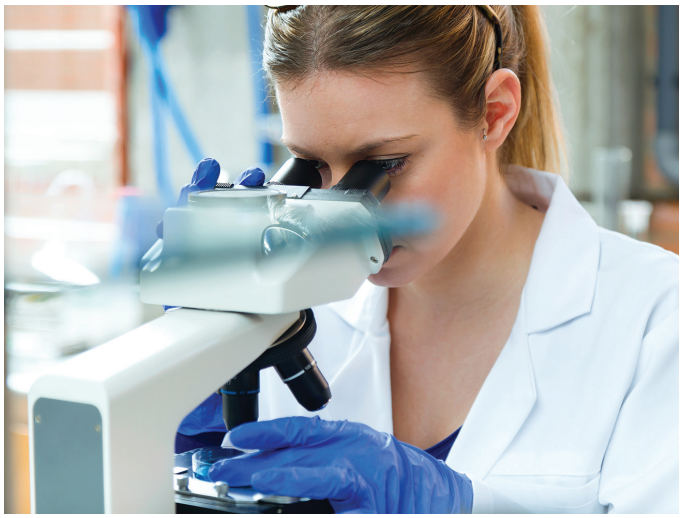
NIST Traceable Size Standards

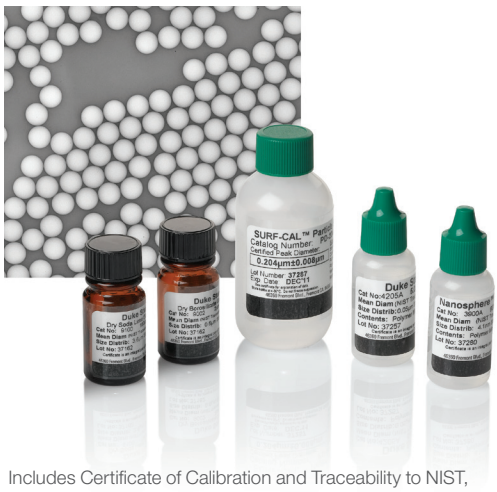
3000, 4000, 8000, 9000 Series

Calibrate and validate particle sizing and counting instruments

Thermo Scientific™ NIST (National Institute of Standards and Technology) Traceable Size Standards work on an open platform without bias or restriction on any instrument brand or model. They come packaged in easy-to-use dropper-tipped bottles to minimize operator error by delivering the precise volume of beads into the instrument. Various polystyrene, silica, and glass beads are available in a broad range of sizes (20 nm to 2000 µm) to satisfy a broad range of instrument quality control and calibration needs.



- NIST traceability provides an official, objective third-party comparison of our beads to a known standard and maintained by the National Institute of Standards and Technology
- Certificate of Calibration and Traceability to NIST enables labs to show compliance to ISO 9000, ISO 10012, ANSI/NCSL Z540, GMP/GLP and other standards and regulations
- Superior uniformity ensures precision in calibration from instrument to instrument, from lab to lab
- Uncertainty of Measurement is stated on the Certificate of Analysis
- Excellent lot-to-lot reproducibility minimizes size shift between calibrations



Includes Certificate of Calibration and Traceability to NIST, which helps in audits by answering the question: "How do you know the instrument is measuring properly?"

ThermoFisher SCIENTIFIC

3000 Series - Monodispersed Beads

Applications: Instrument calibration, microscopy, light scattering studies, colloidal systems research, assessing various sizes of bacterial, viral, ribosomal, and sub-cellular components

The highly uniform 3000 Series of sulfate beads has a very narrow standard deviation since they are calibrated in nanometers using NIST traceable methodology. The 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, the 3000 series size range may change slightly from batch to batch.

3000 Series, 15 mL, 1% Solids	
Diameter	**Cat. Number**
Aqueous Suspensions, Calibrated by Photon Correlation Spectroscopy (PCS)	
20 nm	3020A
30 nm	3030A
40 nm	3040A
Aqueous Suspensions, Calibrated by Transmission Electron Microscopy (TEM)	
50 nm	3050A
60 nm	3060A
70 nm	3070A
80 nm	3080A
90 nm	3090A
100 nm	3100A
125 nm	3125A
150 nm	3150A
200 nm	3200A
220 nm	3220A
240 nm	3240A
270 nm	3269A
300 nm	3300A
350 nm	3350A
400 nm	3400A
450 nm	3450A
500 nm	3495A
500 nm	3500A
560 nm	3560A
600 nm	3600A
700 nm	3700A
800 nm	3800A
900 nm	3900A

4000 Series - Monosized Beads

Applications: Instrument calibration, microscopy, light scattering studies, and colloidal systems research

The nominal diameter of the 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 µm to 160 µm 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 µm to 650 µm are packaged as dry particles. They are made from polystyrene crosslinked with divinylbenzene. The two largest beads (750 µm and 1000 µm) are polymer products

4000 Series, 15 mL		
Diameter	**% Solids**	**Cat. Number**
Aqueous Suspensions, Calibrated by Optical Microscopy		
1.0 µm	1.0	4009A
1.0 µm	1.0	4010A
1.1 µm	1.0	4011A
1.3 µm	1.0	4013A
1.6 µm	1.0	4016A
1.8 µm	1.0	4018A
2.0 µm	0.4	4202A
2.5 µm	0.5	4025A
3.0 µm	0.5	4203A
4.0 µm	0.4	4204A
5.0 µm	0.3	4205A
6.0 µm	0.3	4206A
7.0 µm	0.3	4207A
8.0 µm	0.3	4208A
9.0 µm	0.3	4209A
10 µm	0.2	4210A
12 µm	0.2	4212A
15 µm	0.3	4215A
20 µm	0.3	4220A
25 µm	0.5	4225A
30 µm	0.6	4230A
40 µm	0.7	4240A

4000 Series, 15 mL		
Diameter	**% Solids**	**Cat. Number**
Aqueous Suspensions, Calibrated by Optical Microscopy		
50 µm	1.4	4250A
60 µm	1.2	4260A
70 µm	2.0	4270A
80 µm	1.8	4280A
100 µm	2.1	4310A
115 µm	2.6	4311A
140 µm	4.0	4314A
160 µm	4.8	4316A
Uniform Dry Spheres, Calibrated by Optical Microscopy		
200 µm	2.3×10^5 #/g	4320A
240 µm	1.3×10^5 #/g	4324A
280 µm	8.3×10^4 #/g	4328A
300 µm	6.7×10^4 #/g	4330A
400 µm	2.8×10^4 #/g	4340A
500 µm	1.4×10^4 #/g	4350A
550 µm	1.1×10^4 #/g	4355A
650 µm	6.6×10^3 #/g	4365A
Uniform Dry Spheres, Calibrated by Optical Microscopy - Polymer		
750 µm	3.8×10^3 #/g	4375A
1000 µm	1.6×10^3 #/g	4400A

8000 Series - Silica Beads

Applications: Instrument calibration, microscopy, light scattering studies, and colloidal systems research

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

8000 Series, 15 mL, 2% Solids	
Diameter	**Cat. Number**
0.5 µm	8050
0.7 µm	8070
1.0 µm	8100
1.6 µm	8150

9000 Series - Glass Beads

Applications: Particle measurement spacers

Available as NIST traceable uniform borosilicate or soda lime glass beads, the 9000 Series Duke Standards provide greater tolerance to chemicals and solvents than non-polystyrene beads, and have a higher mechanical and thermal stability. Our process also ensures the removal of any non-spherical and broken beads.

9000 Series, 1 gram		
Diameter	**Approximate Count / Gram**	**Cat. Number**
Uniform Borosilicate Glass Dry Spheres - Calibrated by Optical Microscopy		
2 µm	9.5×10^{10}	9002
5 µm	6.1×10^{9}	9005
8 µm	1.5×10^{9}	9008
10 µm	7.6×10^{8}	9010
15 µm	2.3×10^{8}	9015
20 µm	9.5×10^{7}	9020
Uniform Soda Lime Glass Dry Spheres - Calibrated by Optical Microscopy		
30 µm	2.8×10^{7}	9030
40 µm	1.2×10^{7}	9040
50 µm	6.1×10^{6}	9050
60 µm	3.5×10^{6}	9060
70 µm	2.2×10^{6}	9070
80 µm	1.5×10^{6}	9080
90 µm	1.0×10^{6}	9090
100 µm	7.6×10^{5}	9100
110 µm	5.7×10^{5}	9110
120 µm	4.4×10^{5}	9120
140 µm	2.8×10^{5}	9140
170 µm	1.6×10^{5}	9170
200 µm	9.5×10^{4}	9200
230 µm	6.3×10^{4}	9230
280 µm	3.5×10^{4}	9280
330 µm	2.1×10^{4}	9330
400 µm	1.2×10^{4}	9400
480 µm	6.9×10^{3}	9480
550 µm	4590	9550
650 µm	2780	9650
750 µm	1810	9750
950 µm	890	9950
1000 µm	760	91000
2000 µm	95	92000

Values for Borosilicate and Soda Lime Glass

The following properties (table below) are typical values for bulk borosilicate and soda lime glass. These values have not been measured and are not assay values for a specific batch of particles. The data is for informational purposes only and should not be used as calibration values.

Mechanical/ Electrical/ Thermal Properties		
Units	**Borosilicate Glass**	**Soda Lime Glass**
Young's Modulus [106 psi]	10.5	10.0
Hardness [Moh]	6.5	6-7
Dielectric Constant: [22°C, 106 Hz]	5.8	6.9
Softening Point [°C]	846	700
Typical Composition		
SiO_2	52.5%	60 - 72.5%
Na_2O	0.3%	13.7 - 17%
CaO	22.5%	9.8 - 18%
MgO	1.2%	1 - 3%
Al_2O_3	14.5%	0.4 - 4%
FeO/ Fe_2O_3	0.2%	0 - 0.2%
K_2O	0.2%	0 - 0.1%
B_2O_3	8.6%	0.0%

Note: All diameters shown for all product series (3000, 4000, 8000, 9000) are nominal diameters. Please contact us for exacting diameters.

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Instrument Calibration

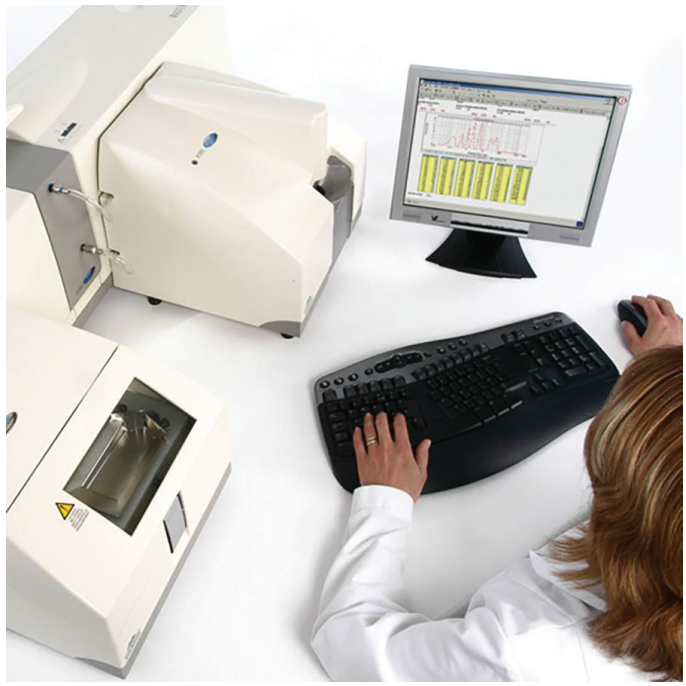
Manufacturers, as well as calibration lab managers and technicians, use size standards to calibrate particle sizing and counting instruments to make sure they size properly and accurately, and comply with regulations. This is done regularly on a daily, weekly and between-test basis due to the eventual degradation of the lasers and optics, which causes inconsistent signals that could result in users working with potentially erroneous data.

Validation/Compliance

For regulated labs and instrument manufacturers, instruments must be tested to ensure they are performing according to the standard operating parameters. There are three basic qualification procedures: installation, operation, and performance.

Industrial

Size standards are used for filter testing, vial washers, spacers, semiconductor wafer fabrication, contamination control, wide-size material analysis, laser diffraction studies, and more. Spacer particles establish the correct cell gap during the assembly of liquid crystal displays and other precision microelectronics. Glass particles have sufficient thermal stability to withstand heating and good compression strength, as to not break or fracture under pressure.



Specifications	3000	4000	8000	9000 (borosilicate)	9000 (soda lime)
Particle composition	Polystyrene	Polystyrene	Silica	Borosilicate glass	Soda lime glass
Density	1.05 g/cm^3	1.05 g/cm^3	1.05 g/cm^3	2.5 - 2.55 g/cm^3	2.4 - 2.6 g/cm^3
Index of Refraction (25°C)	1.59 @ 589 nm	1.59 @ 589 nm	1.40 - 1.46 @ 589 nm	1.56 @ 589 nm	1.50 - 1.52 @ 589 nm
Additives	Trace amount of surfactant		None	None	None
Documentation	Certificate of Calibration & Traceability to NIST				
Storage and handling	Unless otherwise stated, refrigerate (2-8°C) product when not in use but do not freeze. Store upright and keep bottle tightly sealed. Mix product with gentle inversion by hand or vortex mixer prior to use.				

Clinical Diagnostics
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