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May 1, 2007

PARTICLE SIZE STANDARDS
NIST Traceable Mean Diameter

1. DESCRIPTION These particle size standards provide accurate and traceable size calibration for particle size analysis. They are part of a series of monodisperse polymer microspheres with calibrated mean diameters traceable to the Standard Meter through the National Institute of Standards and Technology (NIST). Diameters from 20 nanometers (nm) to 160 micrometers (µm) are available as aqueous suspensions in dropper-tipped vials, calibrated by photon correlation spectroscopy (PCS), transmission electron microscopy (TEM) or optical microscopy. The aqueous medium has been prepared to promote dispersion and reduce clumping of the particles. The approximate particle concentration in percent solids is given to facilitate dilution for the calibration and validation of particle analyzers. Diameters from 200 µm to 1000 µm are available as dry spheres, calibrated by optical microscopy. The certified mean diameter is traceable to NIST. Other values are for information only and should not be used as calibration values.

2. PHYSICAL DATA — Catalog Number: 4009, 4009A and 4009B, Nominal 1.0 µm

Certified Mean Diameter:	0.994 µm ± 0.021 µm
Standard Deviation:	0.010 µm
Coefficient of Variation:	1.0%
Microsphere Composition:	Polystyrene
Microsphere Density:	1.05 g/cm^3
Index of Refraction:	1.59 @ 589 nm
Approximate Concentration:	1.0% solids

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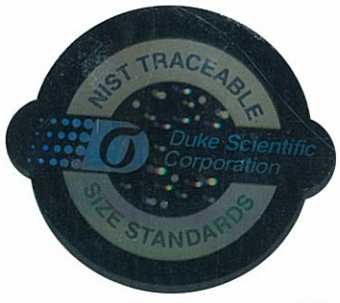
VALUABLE CERTIFICATE - KEEP ON FILE

CERTIFICATE OF CALIBRATION AND TRACEABILITY

This certifies that the calibrated mean diameter dimension of this product was transferred by optical microscopy from a stage micrometer calibrated by the National Institute of Standards and Technology (SRM 2800 SN411). NIST Standard Reference Materials 1690, 1692, 1960, and 1961 were used to validate the accuracy and traceability of the calibration methods.

Catalog Number: 4009, 4009A and 4009B, Uniform Polymer Size Standards
Certified Mean Diameter: 0.994 µm
Uncertainty: ± 0.021 µm
Material Batch: 4009-029
Certification Date: May 1, 2007



Ellen B. Layendecker, Metrology Director
Duke Scientific Products

Packaging Lot # 32288

Expiration Date: AUG'10

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3. MEASUREMENT METHODOLOGY The certified diameter of this product was obtained by optical microscopy from a NIST calibrated stage micrometer, a glass slide engraved with a millimeter scale. The exact line spacing was calibrated by NIST in micrometers. The uncertainty is the sum of the calibration transfer uncertainty and the random error of the measurements. To validate the accuracy of our optical methods, NIST certified microsphere standards were measured using the same method. The size distribution (standard deviation) was obtained by optical microscopy, electron microscopy or electrical resistance analysis depending on the size of the particles. The Coefficient of Variation is the standard deviation as a percentage of the mean diameter.

4. CERTIFICATE Except for the purposes of record keeping, this certificate may not be reproduced. Rebottling or relabeling voids the warranty and invalidates the certification and traceability of these products.

5. OPERATING INSTRUCTIONS For ease of use, standards below 200 µm are packaged in an aqueous suspension. They must be thoroughly dispersed in the bottle to assure statistically consistent samples. To disperse the particles, gently invert the bottle several times, then immerse in a low power ultrasonic bath (10 seconds). Do not shake the bottle, as the small bubbles formed may introduce statistical artifacts. Before using, clear the tip of residue by dispensing 2 - 3 drops into a waste container. Dispense immediately after dispersion using the dropper tip. Standards 200 µm and above are dry and should not be shaken as this may produce static, making the particles hard to handle.

6. SAFETY AND HANDLING PRECAUTIONS Avoid aerosol production in the workplace while handling these products, or wear a suitable filter respirator when necessary. Avoid inhalation or ingestion of the particles. These products should only be used by trained scientific personnel. A Material Safety Data Sheet is included with each package.

7. STORAGE AND DISPOSAL Keep the bottle tightly sealed to avoid contamination. For aqueous standards store them upright to prevent clogging the tip with particles. Refrigeration is not required for storage. Do not freeze the particles. In case of spills, wash or wipe the area thoroughly. Caution: surfaces covered with dry spheres may be very slippery. Wipe area with damp cloth. Dispose of as normal laboratory waste. There are no special disposal procedures. Each bottle has a limited shelf life and should not be used after its expiration date.

8. LIMITED WARRANTY These products are intended for laboratory use by trained scientific personnel. Determination of their suitability for a specific end-use is the responsibility of the user, who assumes all liability for loss or damage arising out of the use of the product. Rebottling or relabeling voids the warranty and certification. Microgenics Corporation's warranty is limited to replacement of defective products if returned with our authorization within 60 days of purchase date.

THE FOREGOING WARRANTY SHALL BE IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MICROGENICS BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES.