

February 5, 2008

**NANOSPHERE™ 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.**

Certified Mean Diameter:	Catalog Number: 3300A and 3300B, Nominal 300 nm
Standard Deviation:	300 nm ± 6 nm
Coefficient of Variation:	5.1 nm
Hydrodynamic Diameter:	1.7%
Microsphere Composition:	298 - 310 nm (PCS)
Microsphere Density:	Polystyrene
Index of Refraction:	1.05 g/cm <sup>3</sup>
Approximate Concentration:	1.59 @ 589 nm
	1% solids

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**VALUABLE CERTIFICATE - KEEP ON FILE****CERTIFICATE OF CALIBRATION AND TRACEABILITY**

This certifies that the calibrated mean diameter was transferred by transmission electron microscopy (TEM) from the National Institute of Standards and Technology (NIST) certified microspheres (Standard Reference Material 1963, 1691 or 1690).

Catalog Number: 3300A and 3300B, Nanosphere™ Size Standards	
Certified Mean Diameter: 300 nm	Material Batch: 3300-030
Uncertainty: ± 6 nm	Certification Date: February 5, 2008

  
Ellen B. Layendecker, Metrology Director  
Duke Scientific Products

Packaging Lot #

33506

Expiration Date:

MAY'11

**3. MEASUREMENT METHODOLOGY** The certified mean diameter of this product was obtained using transmission electron microscopy from NIST certified microspheres. The uncertainty is the sum of the calibration transfer uncertainty and the random error of the measurement. The particle size distribution (standard deviation) was obtained by TEM. The Coefficient of Variation is the standard deviation as a percentage of the mean diameter. The hydrodynamic diameter was measured using photon correlation spectroscopy

**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, these standards 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 dropper tip of residue by dispensing 2-3 drops into a waste container. Dispense immediately after dispersion using the dropper tip.

**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. Store the bottle 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. 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.