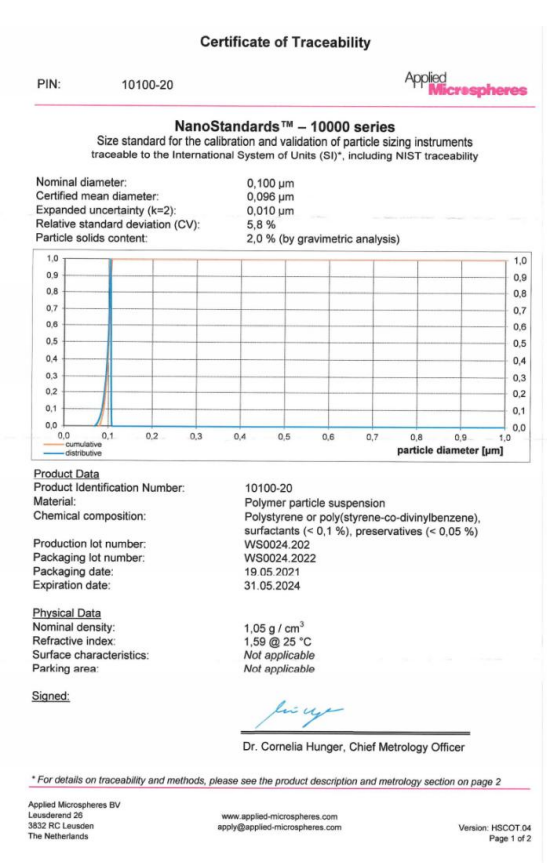
标准粒子证书介绍

关键词：标准物质；标准粒子；溯源性；SI/NIST;不确定度

根据国际标准化组织(ISO)标准物质委员会(REMCO)规定，成为有证标准物质的一个重要前提就是在发放的每个标准物质单元中都随附一份证书。证书内容应包括：Ⅰ溯源性；Ⅱ文件的标题；Ⅲ物质的名称；Ⅳ物质的描述；Ⅴ认定值及其不确定度；Ⅵ测量不确定度；Ⅶ均匀性水平；Ⅷ认定日期；Ⅸ标准物质代码和批号；Ⅹ认定人员的签名或姓名；ⅰ认定机构的名称和地址；ⅱ正确使用标准物质的指导；ⅲ标准物质用途；ⅳ有关安全方面的信息；ⅴ来自独立实验室或方法的值；ⅵ稳定性信息；ⅶ其他信息；（标准粒子属于颗粒类标准物质）

下面我们以德国标粒品牌 AM(Applied Microspheres)粒度标准粒子的标粒证书为例来做详细介绍。



Certificate of Traceability

PIN: 10100-20

Applied Microspheres

NanoStandards™ – 10000 series

Size standard for the calibration and validation of particle sizing instruments traceable to the International System of Units (SI)*, including NIST traceability

Nominal diameter:	0,100 µm
Certified mean diameter:	0,096 µm
Expanded uncertainty (k=2):	0,010 µm
Relative standard deviation (CV):	5,8 %
Particle solids content:	2,0 % (by gravimetric analysis)

Product Data

Product Identification Number:	10100-20
Material:	Polymer particle suspension
Chemical composition:	Polystyrene or poly(styrene-co-divinylbenzene), surfactants (< 0,1 %), preservatives (< 0,05 %)
Production lot number:	WS0024.202
Packaging lot number:	WS0024.2022
Packaging date:	19.05.2021
Expiration date:	31.05.2024

Physical Data

Nominal density:	1,05 g / cm³
Refractive index:	1,59 @ 25 °C
Surface characteristics:	*Not applicable*
Parking area:	*Not applicable*

Signed:

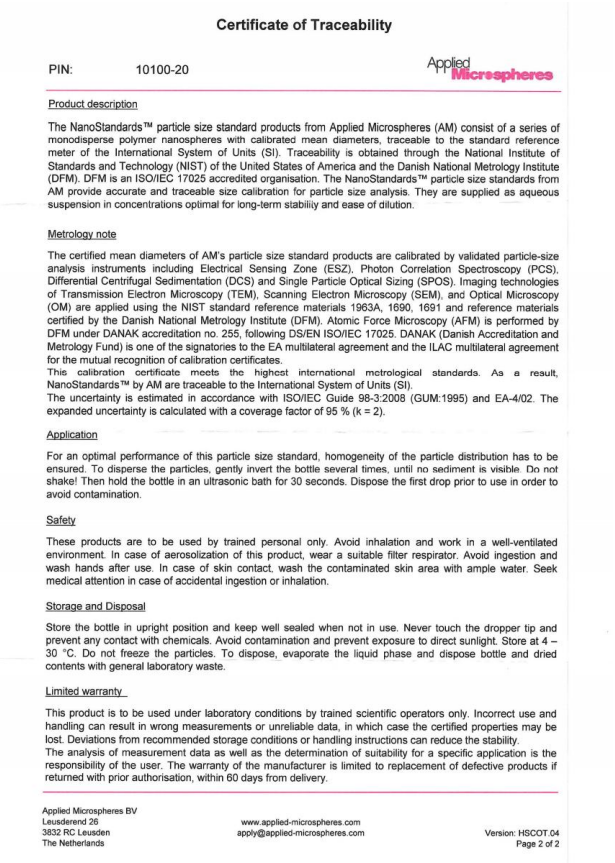
Dr. Cornelia Hunger, Chief Metrology Officer

** For details on traceability and methods, please see the product description and metrology section on page 2*

Applied Microspheres BV
Leusderend 26
3832 RC Leusden
The Netherlands

www.applied-microspheres.com
apply@applied-microspheres.com

Version: HSCOT.04
Page 1 of 2



Certificate of Traceability

PIN: 10100-20

Applied Microspheres

Product description

The NanoStandards™ particle size standard products from Applied Microspheres (AM) consist of a series of monodisperse polymer nanospheres with calibrated mean diameters, traceable to the standard reference meter of the International System of Units (SI). Traceability is obtained through the National Institute of Standards and Technology (NIST) of the United States of America and the Danish National Metrology Institute (DFM). DFM is an ISO/IEC 17025 accredited organisation. The NanoStandards™ particle size standards from AM provide accurate and traceable size calibration for particle size analysis. They are supplied as aqueous suspension in concentrations optimal for long-term stabiliy and ease of dilution.

Metrology note

The certified mean diameters of AM's particle size standard products are calibrated by validated particle-size analysis instruments including Electrical Sensing Zone (ESZ), Photon Correlation Spectroscopy (PCS), Differential Centrifugal Sedimentation (DCS) and Single Particle Optical Sizing (SPOS). Imaging technologies of Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), and Optical Microscopy (OM) are applied using the NIST standard reference materials 1963A, 1690, 1691 and reference materials certified by the Danish National Metrology Institute (DFM). Atomic Force Microscopy (AFM) is performed by DFM under DANAK accreditation no. 255, following DS/EN ISO/IEC 17025. DANAK (Danish Accreditation and Metrology Fund) is one of the signatories to the EA multilateral agreement and the ILAC multilateral agreement for the mutual recognition of calibration certificates.
This calibration certificate meets the highest international metrological standards. As a result, NanoStandards™ by AM are traceable to the International System of Units (SI).
The uncertainty is estimated in accordance with ISO/IEC Guide 98-3:2008 (GUM:1995) and EA-4/02. The expanded uncertainty is calculated with a coverage factor of 95 % (k = 2).

Application

For an optimal performance of this particle size standard, homogeneity of the particle distribution has to be ensured. To disperse the particles, gently invert the bottle several times, until no sediment is visible. Do not shake! Then hold the bottle in an ultrasonic bath for 30 seconds. Dispose the first drop prior to use in order to avoid contamination.

Safety

These products are to be used by trained personal only. Avoid inhalation and work in a well-ventilated environment. In case of aerosolization of this product, wear a suitable filter respirator. Avoid ingestion and wash hands after use. In case of skin contact, wash the contaminated skin area with ample water. Seek medical attention in case of accidental ingestion or inhalation.

Storage and Disposal

Store the bottle in upright position and keep well sealed when not in use. Never touch the dropper tip and prevent any contact with chemicals. Avoid contamination and prevent exposure to direct sunlight. Store at 4 – 30 °C. Do not freeze the particles. To dispose, evaporate the liquid phase and dispose bottle and dried contents with general laboratory waste.

Limited warranty

This product is to be used under laboratory conditions by trained scientific operators only. Incorrect use and handling can result in wrong measurements or unreliable data, in which case the certified properties may be lost. Deviations from recommended storage conditions or handling instructions can reduce the stability.
The analysis of measurement data as well as the determination of suitability for a specific application is the responsibility of the user. The warranty of the manufacturer is limited to replacement of defective products if returned with prior authorisation, within 60 days from delivery.

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3832 RC Leusden
The Netherlands

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apply@applied-microspheres.com

Version: HSCOT.04
Page 2 of 2

AM 标准证书

①基本信息

Certificate of Traceability（溯源证书）、Product Identification Number（PIN，产品识别号，通常成为货号）、Applied Microspheres（AM 实验室）、NanoStandard™—10000serise（纳米标粒 ™—10000 系列）；

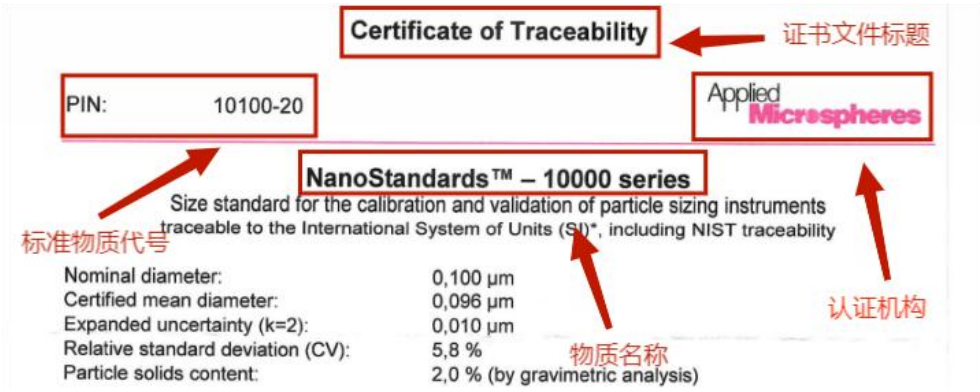


图 1：AM 标粒证书中的基础信息

②溯源性

该标粒的尺寸是通过颗粒粒度测定仪来校准和验证的，可溯源至国际单位制 SI（包括可溯源至美国国家标准研究院 NIST）。

计量溯源性是指通过一条具有规定不确定度的不间断的比较链，使测量结果或测量标准的值能够与规定的参考标准，通常是与国家标准或国际标准联系起来的特性。

只有测量结果是溯源到国际公认的参考标准才能保证这种国际的一致性和可比性。

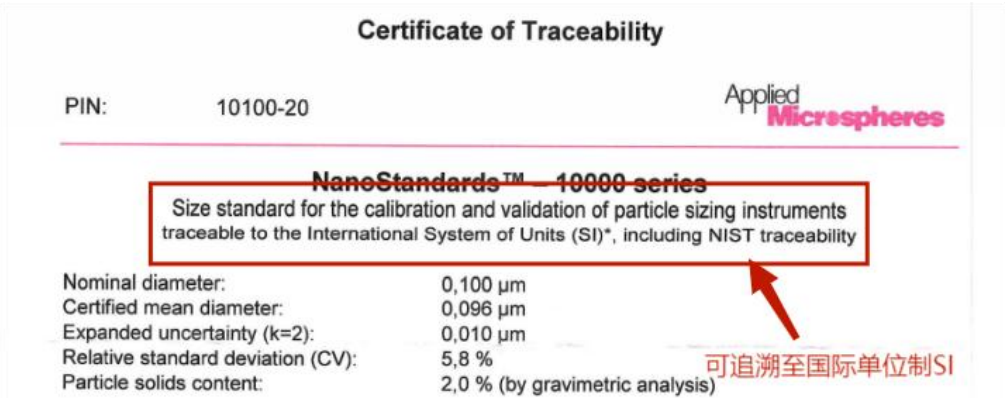
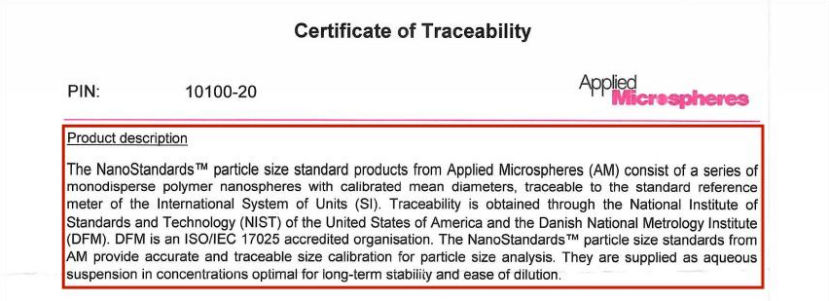


图 2：AM 可追溯至 SI

（1）产品描述

Applied Microspheres(AM)的纳米标粒 ™ 产品由一系列单分散聚合物纳米球组成，具有校准的平均直径，可追溯到国际单位制(SI)的标准参考单位：米。可追溯性是通过美国国家标准和技术研究所(NIST)以及丹麦国家计量研究所(DFM)获得的，DFM 是 ISO/IEC 17025 认证机构。来自 AM 的纳米标粒 ™ 为粒度分析提供了精确和可追溯的粒度校准。AM 标粒悬浮液的浓度是具有最佳的长期稳定性和易于稀释的。



Certificate of Traceability

PIN: 10100-20

Applied Microspheres

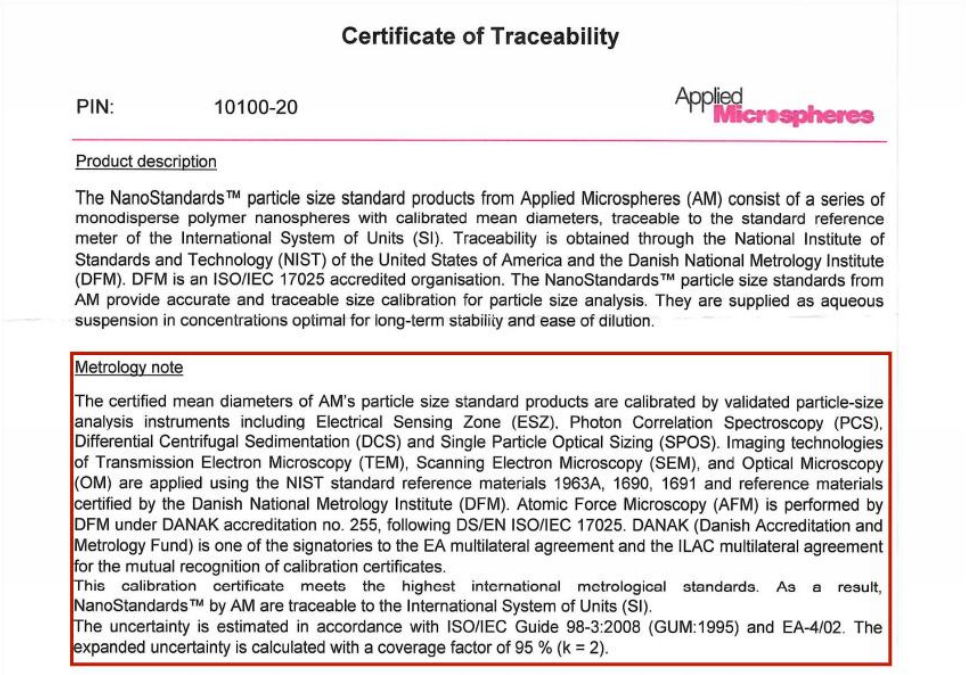
Product description

The NanoStandards™ particle size standard products from Applied Microspheres (AM) consist of a series of monodisperse polymer nanospheres with calibrated mean diameters, traceable to the standard reference meter of the International System of Units (SI). Traceability is obtained through the National Institute of Standards and Technology (NIST) of the United States of America and the Danish National Metrology Institute (DFM). DFM is an ISO/IEC 17025 accredited organisation. The NanoStandards™ particle size standards from AM provide accurate and traceable size calibration for particle size analysis. They are supplied as aqueous suspension in concentrations optimal for long-term stabiliiy and ease of dilution.

图 3：AM 产品介绍

（2）计量报告

AM 标粒产品的认证平均直径是通过验证的粒径分析仪校准的，包括电阻法(ESZ)，光子相关光谱法(PCS)，差速离心沉降法(DCS)和单颗粒光学传感技术(SPOS)仪器。透射电子显微镜(TEM)、扫描电子显微镜(SEM)和光学显微镜(OM)成像技术应用于校准 NIST 标准参考材料和丹麦国家计量研究所(DFM)认证的参考材料。原子力显微镜(AFM)由 DFM 在 DANAK 认证号-255 下进行，遵循 DS/EN ISO/IEC 17025。DANAK(丹麦认可和计量基金会)是相互承认校准证书的 EA 多边协定和 ILAC 多边协定的签署国之一。本校准证书符合国际最高计量标准。因此，AM 的纳米标粒 TM 可追溯至国际单位制(SI)。不确定度根据 ISO/IEC 指南 98-3:2008 (GUM:1995)和 EA-4/02 进行估计。扩展的不确定度计算时，覆盖系数（置信度）为 95% (k = 2)。



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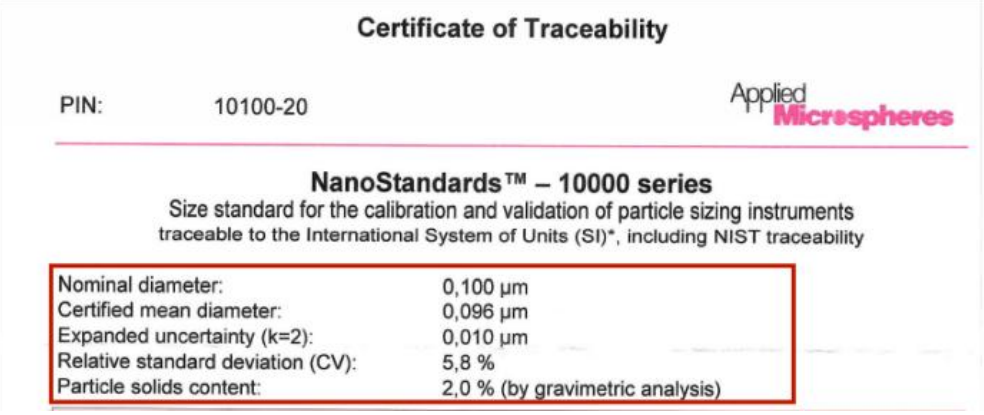
This calibration certificate meets the highest international metrological standards. As a result, NanoStandards™ by AM are traceable to the International System of Units (SI).
The uncertainty is estimated in accordance with ISO/IEC Guide 98-3:2008 (GUM:1995) and EA-4/02. The expanded uncertainty is calculated with a coverage factor of 95 % (k = 2).

图 4：AM 的计量报告

③标粒相关参数



Certificate of Traceability

PIN: 10100-20

Applied Microspheres

NanoStandards™ – 10000 series

Size standard for the calibration and validation of particle sizing instruments traceable to the International System of Units (SI)*, including NIST traceability

Nominal diameter:	0,100 µm
Certified mean diameter:	0,096 µm
Expanded uncertainty (k=2):	0,010 µm
Relative standard deviation (CV):	5,8 %
Particle solids content:	2,0 % (by gravimetric analysis)

图 5：标称粒径、认证的平均粒径（实际颗粒平均粒径）、扩展不确定度（K=2 时）、相对标准偏差（CV 值）、固含量

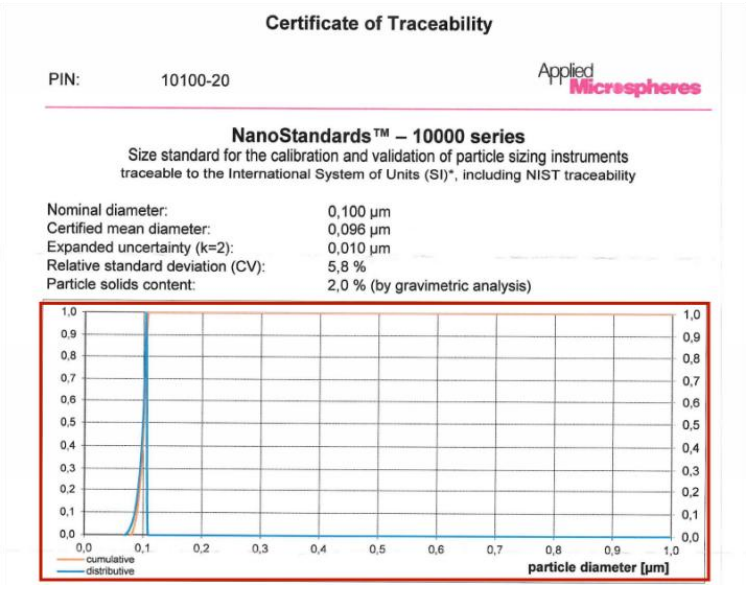


图 6：粒径分布谱图

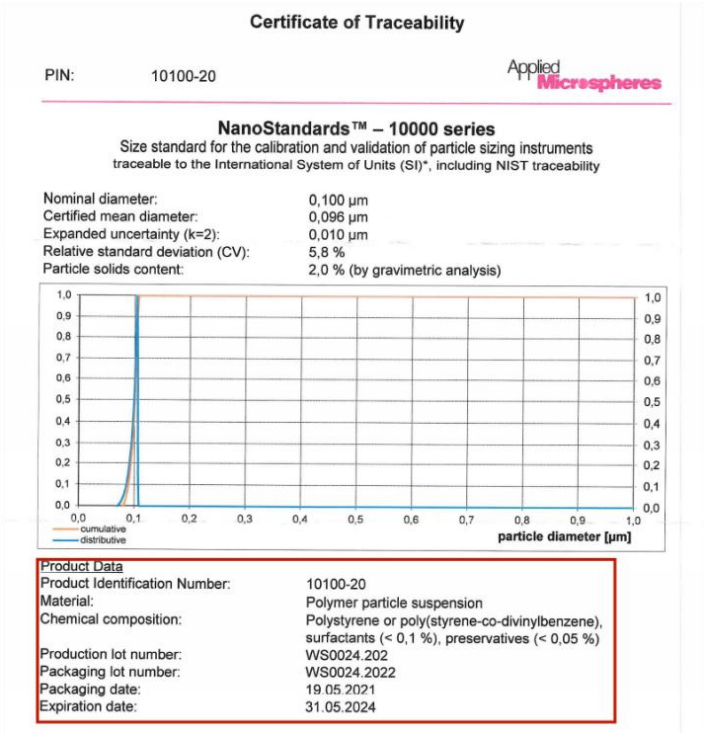
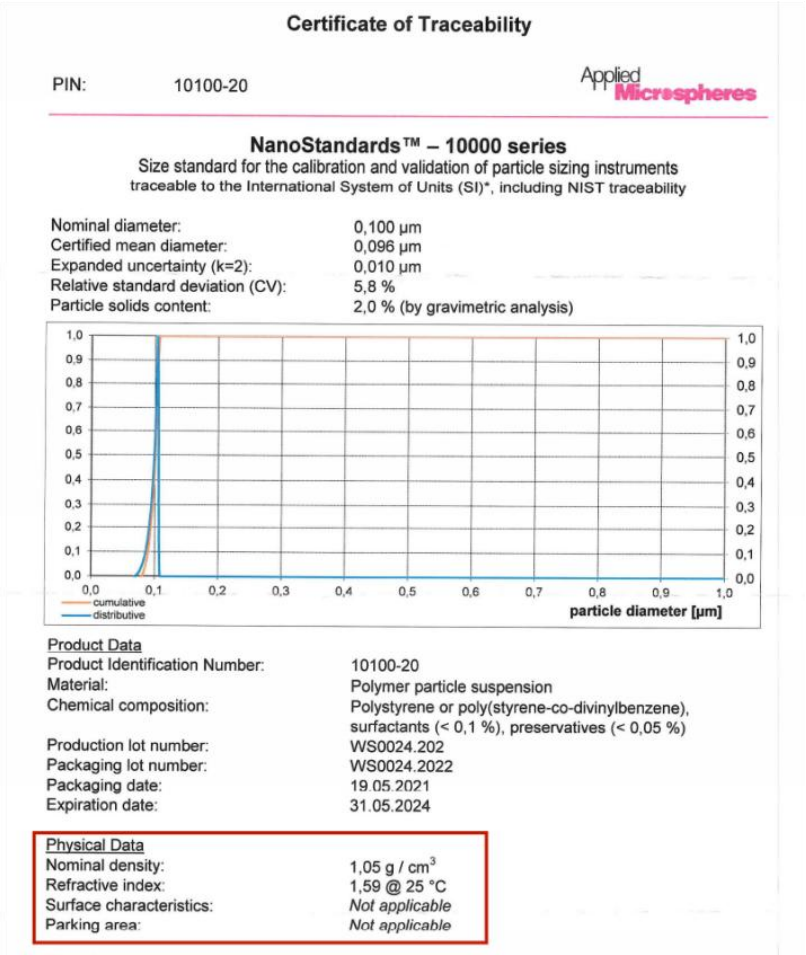


图 7：产品识别号(PIN)、化学名称（聚合颗粒悬浮液）、主要化学组成(PSDVB)、产品批号、包装批号、生产及有效日期



Certificate of Traceability

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Applied Microspheres

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Nominal diameter:	0,100 µm
Certified mean diameter:	0,096 µm
Expanded uncertainty (k=2):	0,010 µm
Relative standard deviation (CV):	5,8 %
Particle solids content:	2,0 % (by gravimetric analysis)

Product Data

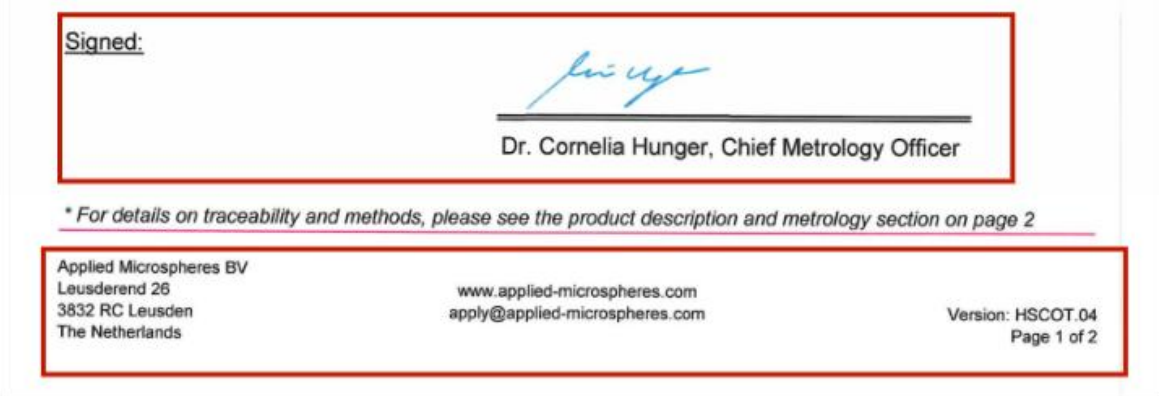
Product Identification Number:	10100-20
Material:	Polymer particle suspension
Chemical composition:	Polystyrene or poly(styrene-co-divinylbenzene), surfactants (< 0,1 %), preservatives (< 0,05 %)
Production lot number:	WS0024.202
Packaging lot number:	WS0024.2022
Packaging date:	19.05.2021
Expiration date:	31.05.2024

Physical Data

Nominal density:	1,05 g / cm^3
Refractive index:	1,59 @ 25 °C
Surface characteristics:	*Not applicable*
Parking area:	*Not applicable*

图 8：标称密度、折射指数（25 摄氏度下为 1.59）

④认定人员的签名或姓名；认定机构的名称和地址



Signed:

Dr. Cornelia Hunger, Chief Metrology Officer

* For details on traceability and methods, please see the product description and metrology section on page 2

Applied Microspheres BV
Leusderend 26
3832 RC Leusden
The Netherlands

www.applied-microspheres.com
apply@applied-microspheres.com

Version: HSCOT.04
Page 1 of 2

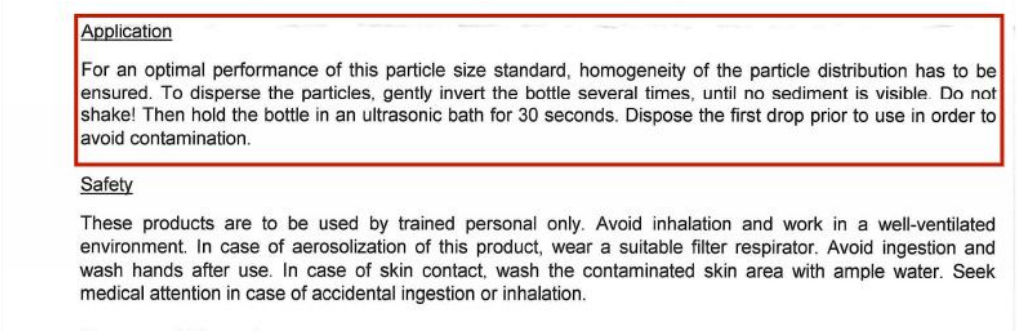
图 9：认定人员的签名或姓名以及认定机构的名称和地址

⑤使用说明

（1）使用处理

为了使该粒径标准达到最佳性能，务必保证颗粒分布的均匀性。为了分散颗粒，可以轻轻地将瓶子翻转几次，直到看不到沉淀物。不要猛摇，避免产生气泡！可以将瓶子放入超声波浴中 30 秒。使用前先处理掉第一滴，避免污

染。


Application

For an optimal performance of this particle size standard, homogeneity of the particle distribution has to be ensured. To disperse the particles, gently invert the bottle several times, until no sediment is visible. Do not shake! Then hold the bottle in an ultrasonic bath for 30 seconds. Dispose the first drop prior to use in order to avoid contamination.

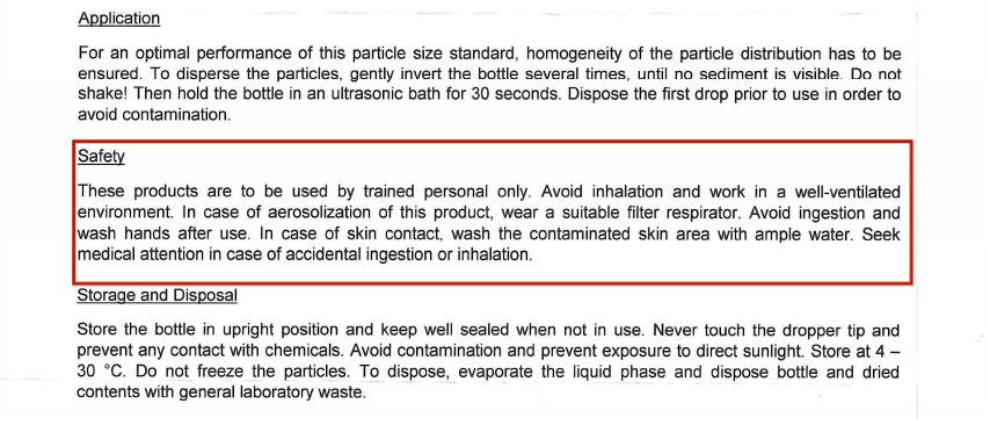
Safety

These products are to be used by trained personal only. Avoid inhalation and work in a well-ventilated environment. In case of aerosolization of this product, wear a suitable filter respirator. Avoid ingestion and wash hands after use. In case of skin contact, wash the contaminated skin area with ample water. Seek medical attention in case of accidental ingestion or inhalation.

图 10：AM 的使用处理说明

（2）安全事项

这些产品尽量由训练有素的人员使用。避免吸入，建议在通风良好的环境中使用。如果本产品雾化，请佩戴合适的过滤式呼吸器。避免摄入，使用后要洗手。如果皮肤接触，请使用充足的水清洗。如果意外摄入或吸入，立即就医。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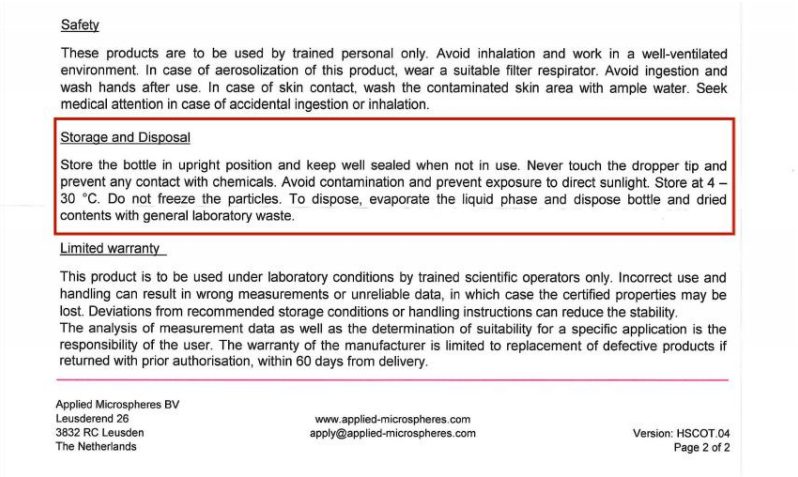
Storage and Disposal

Store the bottle in upright position and keep well sealed when not in use. Never touch the dropper tip and prevent any contact with chemicals. Avoid contamination and prevent exposure to direct sunlight. Store at 4 – 30 °C. Do not freeze the particles. To dispose, evaporate the liquid phase and dispose bottle and dried contents with general laboratory waste.

图 11：AM 的安全事项说明

（3）存储和废物处理

将瓶子竖直放置，不使用时保持良好密封。不要触摸滴管尖端，防止接触任何化学物质。避免污染，避免阳光直射。储存温度尽量在 4-30℃。不要冷冻粒子。废物处理：蒸发液相、放入处理瓶中或者干燥的内容物，和一般实验室废物处理一样。



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Limited warranty

This product is to be used under laboratory conditions by trained scientific operators only. Incorrect use and handling can result in wrong measurements or unreliable data, in which case the certified properties may be lost. Deviations from recommended storage conditions or handling instructions can reduce the stability.
The analysis of measurement data as well as the determination of suitability for a specific application is the responsibility of the user. The warranty of the manufacturer is limited to replacement of defective products if returned with prior authorisation, within 60 days from delivery.

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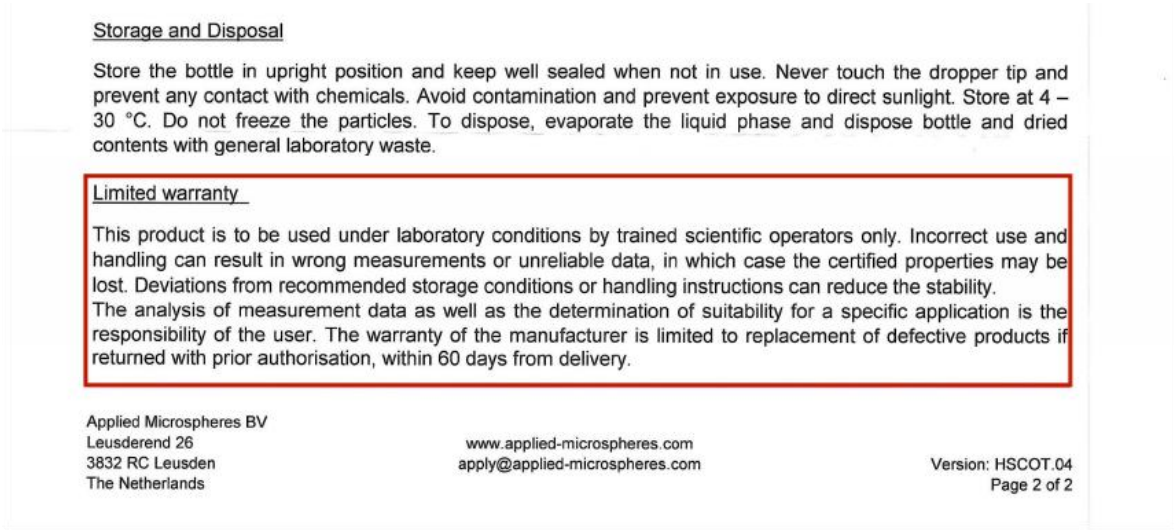
Version: HSCOT.04
Page 2 of 2

图 12：AM 的存储和废物处理说明

（4）误差说明与保修

本产品只能由经过培训的专业操作人员在实验室条件下使用。不正确的使用和处理会导致错误的测量结果或不可靠的数据，在这种情况下，认证的属性可能会丢失。偏离推荐的储存条件或操作说明会降低稳定性。对测量数据的分析以及对特定应用程序的适用性的确定是用户的责任。制造商的保证仅限于更换有缺陷的产品，如果事先授权，在交货后 60 天内退回。



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Version: HSCOT.04
Page 2 of 2

图 14：AM 的误差与维修说明

以上为以 AM 标粒为例的标准物质证书介绍，想知道更多关于标粒的参数解读，敬请关注！