GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 13.040.35

CCS C 70

GB/T 25915.1-2021

Replacing GB/T 25915.1-2010

Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness by particle concentration

(ISO 14644-1:2015, MOD)

洁净室及相关受控环境 第 1 部分:按粒子浓度划分空气洁净度等级

Issued on: August 20, 2021 **Implemented on: March 01, 2022**

Issued by: State Administration for Market Regulation;
Standardization Administration of the People's Republic of China.

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Foreword

This document was drafted in accordance with the rules provided in GB/T 1.1-2020 *Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents*.

This document is Part 1 of GB/T 25915, *Cleanrooms and associated controlled environments*. The following parts have been issued for GB/T 25915:

-- Part 1: Classification of air cleanliness by particle concentration;

-- Part 2: Monitoring to provide evidence of cleanroom performance related to air cleanliness by particle concentration;

-- Part 3: Test methods;

-- Part 4: Design, construction and start-up;

-- Part 5: Operations;

-- Part 6: Vocabulary;

-- Part 7: Separative devices (clean air hoods, gloveboxes, isolators and minienvironments);

-- Part 8: Classification of air cleanliness by chemical concentration (ACC);

-- Part 9: Classification of surface cleanliness by particle concentration;

-- Part 10: Classification of surface cleanliness by chemical concentration;

-- Part 12: Specifications for monitoring of air cleanliness by nanoscale particle concentration.

This document serves as a replacement of GB/T 25915.1-2010 *Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness*. In comparison with GB/T 25915.1-2010, apart from structural adjustments and editorial modifications, the main technical changes are as follows:

a) Add apparatus requirements for particle determination in Clause 1 (see Clause 1);

b) Add “Normative references” (see Clause 2);

c) in Clause 3 Terms and definitions:

-- Modify the definitions of cleanroom, clean zone, classification, particle, etc. (see 3.1.1, 3.1.2, 3.1.4, 3.2.1; 2.1.1 of the 2010 edition);

-- Delete terms such as ultrafine particle, fiber, U descriptor, customer and supplier (2.2.5, 2.2.7, 2.3.1, 2.5.1 and 2.5.2 of the 2010 version);

-- Add definitions such as unidirectional airflow, non-unidirectional airflow, resolution, maximum permissible measurement error, light scattering (discrete) airborne particle counter, discrete-macroparticle counter and time-of-flight particle sizing apparatus (see 3.2.7, 3.2.8, 3.4.1, 3.4.2, 3.5.1, 3.5.2, 3.5.3);

d) Add notes to Table 1 (see Table 1);

e) Add a clear application particle size range (see 4.2);

f) Add the intermediate decimal cleanliness classes and particle size thresholds (see 4.5);

g) Modify the contents of Annex B and Annex C and integrate them into the normative Annex A (see Annex A; Annex B and Annex C of the 2010 version);

h) Enrich the content of Annex D to Annex B (see Annex B; Annex D of the 2010 edition);

i) Delete the content of ultrafine particle in Annex E, enrich the technical requirements for counting and sizing of macroparticles, and integrate them into Annex C (see Annex C; Annex E of the 2010 version);

j) Modify Annex F and integrate it into Annex D (see Annex F; Annex D of the 2010 edition);

k) Add notes on the intermediate decimal cleanliness classes and particle size thresholds (see Annex E);

l) Delete Annex A “Illustration of cleanliness” (see Annex A of the 2010 version).

This document modifies and adopts ISO 14644-1:2015 *Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness by particle concentration*.

The technical differences between this document and ISO 14644-1:2015, and the causes for these differences are as follows:

-- Modify Formula (A.1) in the normative Annex A. The reason is that Formula (A.1) is applicable to clean rooms with smaller areas. For large-scale and ultra-large-scale clean rooms above 10 000 m^2 in our country, it exposes the problems of too many sampling locations and failure to adopt more reasonable sampling statistical principles.

This document also makes the following editorial modifications:

Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness by particle concentration

1 Scope

This document specifies the classification of air cleanliness in terms of concentration of airborne particles in cleanrooms and clean zones; and separative devices as defined in GB/T 25915.7.

Only particle populations having cumulative distributions based on threshold (lower limit) particle sizes of 0.1 μm ~ 5 μm are considered for classification purposes.

Concentrations of ultrafine particles (< 0.1 μm) will be addressed in a separate standard to specify air cleanliness by nano-scale particles. The use of light scattering (discrete) airborne particle counters (LSAPC) is the basis for determination of the concentration of macroparticles (> 5 μm) at designated sampling locations. An M descriptor may be used to quantify populations of macroparticles.

This document cannot be used to characterize the physical, chemical, radiological, viable or other nature of airborne particles.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 25915.2-2021, Cleanrooms and associated controlled environments - Part 2: Monitoring to provide evidence of cleanroom performance related to air cleanliness by particle concentration (ISO 14644-2:2015, IDT)

GB/T 25915.7, Cleanrooms and associated controlled environments - Part 7: Separative devices (clean air hoods, gloveboxes, isolators and minienvironments) (GB/T 25915.7-2020, ISO 14644-7:2004, IDT)

GB/T 29024.4-2017, Determination of particle size distribution - Single particle light interaction methods - Part 4: Light scattering airborne particle counter for clean spaces (ISO 21501-4:2007, IDT)

Compliance with air cleanliness (ISO Class) requirements specified by the customer is verified by performing specified testing procedures and by providing documentation of the results and conditions of testing.

At-rest or operational classification may be performed periodically based upon risk assessment of the application, typically on an annual basis.

For monitoring cleanrooms, clean zones and separative devices, GB/T 25915.2-2021 shall be used.

Note: Where the installation is equipped with instrumentation for continuous or frequent monitoring of air cleanliness by particle concentration and other parameters of performance as applicable, the time intervals between classification may be extended provided that the results of the monitoring remain within the specified limits.

5.2 Testing

The reference test method for demonstrating compliance is given in Annex A (normative). Alternative methods or instrumentation (or both), having at least comparable performance, may be specified. If no alternative is specified or agreed upon, the reference method shall be used.

Tests performed to demonstrate compliance shall be conducted using instruments which are in compliance with calibration requirements at the time of testing.

5.3 Airborne particle concentration evaluation

Upon completion of testing in accordance with Annex A, the concentration of particles (expressed as number of particles per cubic metre) in a single sample volume at each sampling location shall not exceed the concentration limit(s) given in Table 1 or Table E.1 for intermediate decimal classes for the considered size(s). If multiple single sample volumes are taken at a sampling location, the concentrations shall be averaged and the average concentration must not exceed the concentration limits given in Table 1 or Table E 1. Intermediate particle sizes shall be derived from Formula (E.1).

Particle concentrations used for determination of compliance with ISO Classes shall be measured by the same method for all considered particle sizes.

5.4 Test report

The results from testing each cleanroom or clean zone shall be recorded and submitted as a comprehensive report, along with a statement of compliance or non-compliance with the specified designation of air cleanliness class by particle concentration.

The test report shall include:

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