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Cleanrooms and associated controlled environments —

Part 13: Cleaning of surfaces to achieve defined levels of cleanliness in terms of particle and chemical concentration

Salles propres et environnements maîtrisés apparentés —

Partie 13: Nettoyage des surfaces afin d'obtenir des niveaux de gradation de la propreté par rapport à la concentration particulaire et chimique

Reference number
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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 209, *Cleanrooms and associated controlled environments*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 243, *Cleanroom technology,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 14644-13:2017), of which it constitutes a minor revision. The changes are as follows:

— term class (classification, classified) changed to levels or assessment where appropriate;

— updated document titles and issue dates where appropriate;

— minor editorial changes;

— removed references not cited in the document.

A list of all parts in the ISO 14644 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The term surface refers to the interface between two phases. For the purpose of this document, the surface is a solid. A “clean surface” is where one or more of the contamination categories (particles, chemical) are under control due to cleaning/decontamination. The degree of cleanliness is specified in the corresponding surface cleanliness levels (see ISO 14644-9 and ISO 14644-10). Different cleaning methods are necessary depending on the degree of cleanliness (cleanliness level) required. This document gives guidance on the selection of cleaning methods to achieve specified cleanliness levels. For the selection procedure, the aspects of surface description, cleanliness specifications, types of contamination, cleaning techniques, material compatibility, and assessment methodology are taken into consideration. Most of the methods are suitable for removal of more than one contamination category at the same time; therefore, a common standard for the selection of a cleaning method for both particles, as well as chemical contamination, is needed.

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Cleanrooms and associated controlled environments —

Part 13: Cleaning of surfaces to achieve defined levels of cleanliness in terms of particle and chemical concentration

1 Scope

This document gives guidelines for cleaning to a specified degree on cleanroom surfaces, surfaces of equipment in a cleanroom and surfaces of materials in a cleanroom. Under consideration are all surfaces (external or internal) that are of interest. It provides guidance on the assessment of cleaning methods for achieving the required surface cleanliness by particle concentration (SCP) and surface cleanliness by chemical concentration (SCC) levels and which techniques should be considered to achieve these specified levels.

The appropriateness of cleaning techniques will make reference to the cleanliness levels and associated test methods found in ISO 14644-9 and ISO 14644-10.

The document gives general guidance on the following:

— expected surface cleanliness levels;

— suitability of cleaning methods;

— compatibility of surfaces with the cleaning technique;

— assessment of cleaning appropriateness.

The following are excluded from this document:

— classification of cleaning methods;

— product produced within a cleanroom;

— specific surface-related cleaning methods;

— detailed description of cleaning mechanisms, methods and procedures of various cleaning methods;

— detailed material characteristics;

— description of damage mechanisms by cleaning processes and time-dependent effects;

— references to interactive bonding forces between contaminants and surfaces or generation processes that are usually time-dependent and process-dependent;

— other characteristics of particles such as electrostatic charge, ionic charges, etc.;

— chemical reactions between molecular contaminants and surfaces;

— microbiological aspects of surface cleanliness;

— radioactive aspects of contamination;

— health and safety considerations;

— environmental aspects such as waste disposal, emissions, etc.;

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— selection and use of statistical methods.

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 edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14644-8, *Cleanrooms and associated controlled environments — Part 8: Assessment of air cleanliness by chemical concentration (ACC)*

ISO 14644-9, *Cleanrooms and associated controlled environments — Part 9: Assessment of surface cleanliness for particle concentration*

ISO 14644-10, *Cleanrooms and associated controlled environments — Part 10: Assessment of surface cleanliness for chemical contamination*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14644-9, ISO 14644-10 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
cleanliness
<of a solid surface> condition of a solid surface where the amount of *contamination* (3.4) (particle, chemical) is controlled to a specific level

3.2
cleaning appropriateness
relation between the required *cleanliness* (3.1) and the accomplished cleanliness under controlled conditions

Note 1 to entry: In some languages, the term cleaning efficacy is used to indicate cleaning appropriateness.

Note 2 to entry: In case of real operational conditions or monitoring, the term cleaning effectiveness is used.

3.3
cleaning efficiency
fraction of specific contaminants removed from a surface by a cleaning process

Note 1 to entry: The fraction is determined by the accomplished surface cleanliness in respect to the initial surface cleanliness.

3.4
contamination
unwanted matter in an undesirable location

3.5
particle
minute piece of matter with defined physical boundaries

[SOURCE: ISO 14644-1:2015, 3.2.1]

3.6
particle contamination
particles (3.5) having the potential to affect the process, the product, the personnel or the facilities

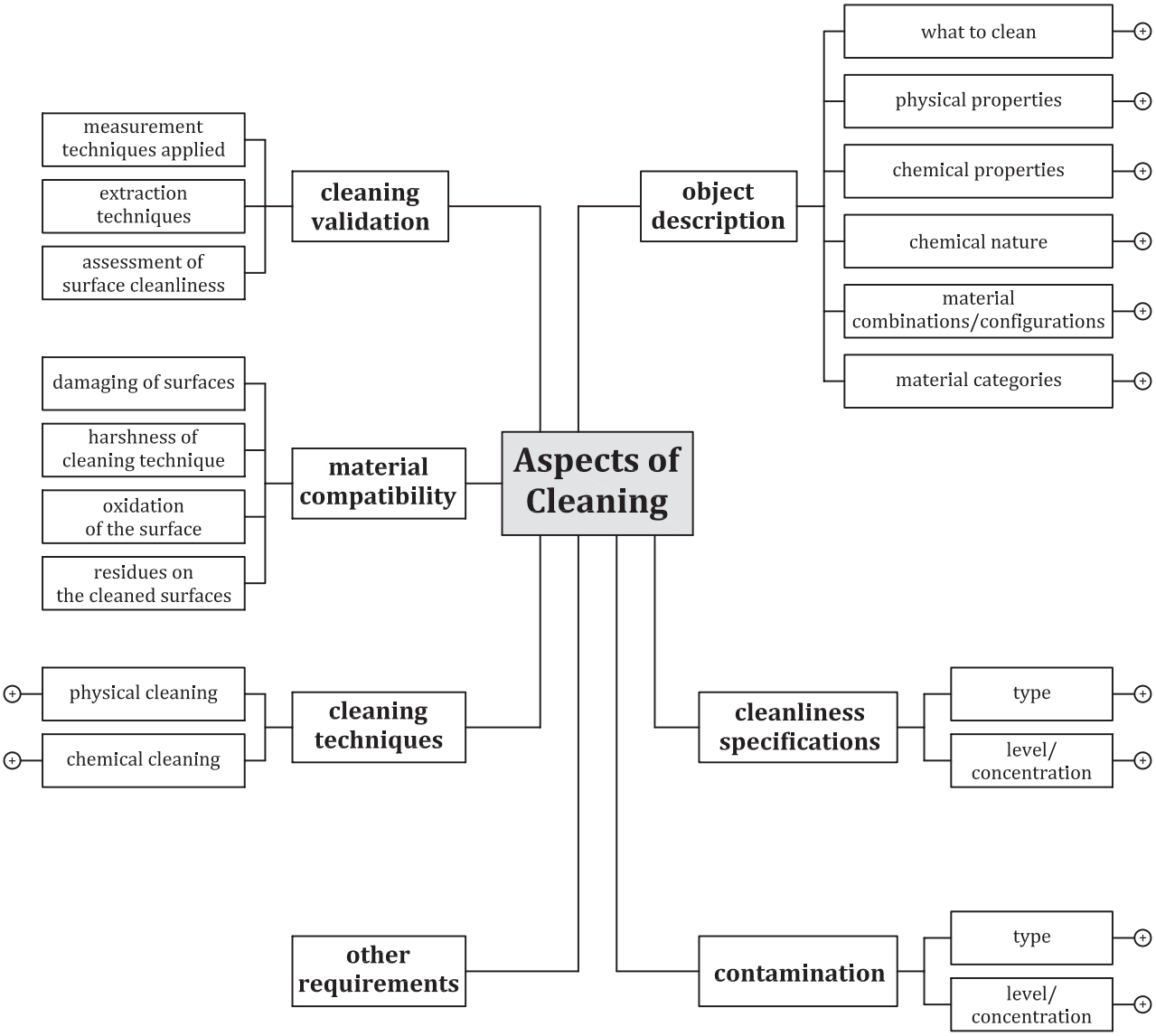
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3.7
particle size
diameter of a sphere that produces a response, by a given particle-sizing instrument, that is equivalent to the response produced by the *particle* (3.5) being measured

4 General methodology

4.1 Overview

Multiple aspects need to be considered for cleaning. Figure 1 provides an overview of the factors that contribute to the suitability of cleaning methods to achieve a defined level of surface cleanliness. For more details, see Annex A.



Key
⊕ more details in Figure A.1

Figure 1 — Overview of cleaning aspects (non-exhaustive)

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