

Cleanrooms and associated controlled environments — Biocontamination control —

Part 1: General principles and methods

The European Standard EN ISO 14698-1:2003 has the status of a British Standard

ICS 13.040.35

National foreword

This British Standard is the official English language version of EN ISO 14698-1:2003. It is identical with ISO 14698-1:2003.

The UK participation in its preparation was entrusted to Technical Committee LBI/30, Cleanroom technology, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2003

Summary of pages

This document comprises a front cover, an inside front cover, the EN ISO title page, the EN ISO foreword page, the ISO title page, pages ii to v, a blank page, pages 1 to 32, the Annex ZA page and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments
14813 Corrigendum No.1	27 October 2003	Correction to EN ISO foreword and incorporating the Annex ZA page

© BSI 27 October 2003

ISBN 0 580 42690 4

English version

**Cleanrooms and associated controlled environments -
Biocontamination control - Part 1: General principles and
methods (ISO 14698-1:2003)**

Salles propres et environnements maîtrisés apparentés -
Maîtrise de la biocontamination - Partie 1: Principes
généraux et méthodes (ISO 14698-1:2003)

Reinräume und zugehörige Reinraumbereiche -
Biokontamination - Teil 1: Allgemeine Grundlagen (ISO
14698-1:2003)

This European Standard was approved by CEN on 10 July 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

CORRECTED 2003-10-01

Foreword

This document (EN ISO 14698-1:2003) has been prepared by Technical Committee ISO/TC 209 "Cleanrooms and associated controlled environments" in collaboration with Technical Committee CEN/TC 243 "Cleanroom technology", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2004, and conflicting national standards shall be withdrawn at the latest by March 2004.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 14698-1:2003 has been approved by CEN as EN ISO 14698-1:2003 without any modifications.

NOTE Normative references to International Standards are listed in Annex ZA (normative).

INTERNATIONAL STANDARD

ISO
14698-1

First edition
2003-09-01

Cleanrooms and associated controlled environments — Biocontamination control —

Part 1: General principles and methods

Salles propres et environnements maîtrisés apparentés — Maîtrise de la biocontamination —

Partie 1: Principes généraux et méthodes



Reference number
ISO 14698-1:2003(E)

AVA Documents
Document Sharing Hub

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principles of biocontamination control	4
5 Establishing the Formal System	5
6 Expression, interpretation and reporting of results	10
7 Verification of the Formal System	11
8 Training	11
9 Documentation	11
Annex A (informative) Guidance on determining airborne biocontamination	12
Annex B (informative) Guidance on validating air samplers	15
Annex C (informative) Guidance on determining biocontamination of surfaces	18
Annex D (informative) Guidance on determining biocontamination of textiles	20
Annex E (informative) Guidance on validating laundering processes	22
Annex F (informative) Guidance on determining biocontamination of liquids	26
Annex G (informative) Guidance on training	28
Bibliography	31

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14698-1 was prepared by Technical Committee ISO/TC 209, *Cleanrooms and associated controlled environments*.

ISO 14698 consists of the following parts, under the general title *Cleanrooms and associated controlled environments — Biocontamination control*:

- *Part 1: General principles and methods*
- *Part 2: Evaluation and interpretation of biocontamination data*

Introduction

The principles described here are intended to promote appropriate hygienic practices. This part of ISO 14698 is one of a number of standards considering factors important for the creation of clean, controlled environments.

Hygiene has become increasingly important in many areas of modern society. In such areas, hygiene or biocontamination control methods are, or will be, used to create safe and stable products. International trade in hygiene-sensitive products has greatly increased. At the same time, the use of antimicrobial agents has been reduced or forbidden, creating a need for increased biocontamination control.

This part of ISO 14698 is the first general International Standard for biocontamination control. However, many factors besides cleanliness must be considered in the design, specification, operation and control of cleanrooms and associated controlled environments.

In some circumstances, relevant regulatory agencies could impose supplementary policies or restrictions. In such situations, appropriate adaptations of the standard testing procedures might be required.

Cleanrooms and associated controlled environments — Biocontamination control —

Part 1: General principles and methods

1 Scope

This part of ISO 14698 establishes the principles and basic methodology of a formal system of biocontamination control (Formal System) for assessing and controlling biocontamination when cleanroom technology is applied for that purpose. This part of ISO 14698 specifies the methods required for monitoring risk zones in a consistent way and for applying control measures appropriate to the degree of risk involved. In zones where risk is low, it can be used as a source of information.

Application-specific requirements are not given. Neither are fire and safety issues addressed; for these, see regulatory requirements and other national or local documentation.

2 Normative references

The following referenced documents are indispensable for the application 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 14644-4:2001, *Cleanrooms and associated controlled environments — Part 4: Design, construction and start-up*

ISO 14698-2:2003, *Cleanrooms and associated controlled environments — Biocontamination control — Part 2: Evaluation and interpretation of biocontamination data*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 General

3.1.1

action level

level set by the user in the context of controlled environments, which, when exceeded, requires immediate intervention, including investigation of cause, and corrective action

3.1.2

alert level

level set by the user in the context of controlled environments, giving early warning of a drift from normal conditions, which, when exceeded, should result in increased attention to the process

3.1.3

bioaerosol

dispersed biological agents in a gaseous environment

3.1.4

biocontamination

contamination of materials, devices, individuals, surfaces, liquids, gases or air with viable particles

3.1.5

cleanroom

room in which the concentration of airborne particles is controlled, and which is constructed and used in a manner to minimize the introduction, generation, and retention of particles inside the room, and in which other relevant parameters e.g. temperature, humidity, and pressure, are controlled as necessary

[ISO 14644-1:1999, 2.1.1]^[1]

3.1.6

contact device

specially designed appliance holding an appropriate, sterile, culture medium with an accessible surface used for surface sampling

3.1.7

contact plate

contact device where the container is a rigid dish

3.1.8

control point

point in a controlled environment at which control is applied and a hazard can be prevented, eliminated or reduced to acceptable levels

3.1.9

controlled environment

defined zone in which sources of contamination are controlled by specified means

3.1.10

corrective action

action to be taken when the results of monitoring indicate that alert or action levels are exceeded

3.1.11

Formal System

system of biocontamination control with established and documented procedures

3.1.12

hazard

potential source of harm

[ISO/IEC Guide 51:1999, 3.5]^[2]

3.1.13

impact sampler

device designed to sample particles in the air, or other gas, through a collision with a solid surface

3.1.14

impingement sampler

device designed to sample particles in the air, or other gas, through a collision with a liquid surface and the subsequent entering into the liquid

3.1.15**qualification**

process of demonstrating whether an entity — activity or process, product, organization, or any combination thereof — is capable of fulfilling specified requirements

3.1.16**risk**

combination of the probability of occurrence of harm and the severity of that harm

[ISO/IEC Guide 51:1999, 3.2]^[2]

3.1.17**risk zone**

defined and delimited space where individuals, products or materials (or any combination of these) are particularly vulnerable to contamination

3.1.18**settle plate**

suitable container (e.g. a Petri dish) of appropriate size, containing an appropriate, sterile, culture medium, which is left open for a defined period to collect viable particles depositing from the air

3.1.19**swab**

sterile collection device, non-toxic and non-inhibitory to the growth of the microorganisms being sampled, consisting of a specific matrix of suitable size, mounted on an applicator

3.1.20**target level**

defined level set by the user as a goal for routine operations, for the user's own purpose

3.1.21**validation**

confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled

[ISO 9000:2000, 3.8.5]^[3]

3.1.22**verification**

confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

[ISO 9000:2000, 3.8.4]^[3]

NOTE Monitoring and auditing methods, procedures and tests, including random sampling and analysis, can be used in the verification of the Formal System.

3.1.23**viable particle**

particle that consists of, or supports, one or more live microorganisms

3.1.24**viable unit****VU**

one or more viable particles which are enumerated as a single unit

NOTE When viable units are enumerated as colonies on agar media, it is common usage to name them colony forming units (CFU). One CFU might consist of one or more VU.

3.2 Occupancy states

**3.2.1
as-built**
condition where the installation is complete with all services connected and functioning, but with no production equipment, materials or personnel present

[ISO 14644-1:1999, 2.4.1]^[1]

**3.2.2
at-rest**
condition where the installation is complete with equipment installed and operating in a manner agreed upon by the customer and supplier, but with no personnel present

[ISO 14644-1:1999, 2.4.2]^[1]

**3.2.3
operational**
condition where the installation is functioning in the specified manner, with the specified number of personnel present and working in the manner agreed upon

[ISO 14644-1:1999, 2.4.3]^[1]

4 Principles of biocontamination control

4.1 A formal system of biocontamination control (Formal System) shall be established, implemented and maintained within cleanrooms and associated environments. The Formal System will assess and control factors that can affect the microbiological quality of the process and product.

There are a number of accepted methods for achieving this goal by risk assessment^{[4], [5]}. The hazard analysis critical control point (HACCP) system^{[6], [7], [8], [9]} is commonly used. Fault tree analysis (FTA)^[10], or the failure mode and effect analysis (FMEA)^[11], or any other validated equivalent system can be used.

In many such methods, any type of hazard can be considered. Within this part of ISO 14698, only microbiological hazards are addressed.

4.2 To assess and control the microbiological hazards, any selected system shall address the following principles:

- a) identification of potential hazard(s) to the process or product, assessment of the likelihood of occurrence of these hazard(s), and identification of measures for their prevention or control;
- b) designation of risk zones and, in each zone, determination of the points, procedures, operational steps and environmental conditions that can be controlled to eliminate the hazard(s) or minimize the likelihood of their occurrence;
- c) establishment of limits to ensure control;
- d) establishment of a monitoring and observation schedule;
- e) establishment of corrective actions to be taken when monitoring results indicate that a particular point, procedure, operational step or environmental condition is not under control;
- f) establishment of procedures, which may include supplementary tests and procedures, to verify that the chosen Formal System is working effectively;
- g) establishment of training procedures;
- h) establishment and maintenance of appropriate documentation.