

Australian/New Zealand Standard™

**Sterilization of health care products—
Radiation**

**Part 2: Establishing the sterilization
dose**



AS/NZS ISO 11137.2:2006

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee HE-023, Processing of Medical and Surgical Instruments. It was approved on behalf of the Council of Standards Australia on 17 October 2006 and on behalf of the Council of Standards New Zealand on 17 November 2006. This Standard was published on 19 December 2006.

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee HE-023, Processing of Medical and Surgical Instruments, to supersede (in part) AS ISO 11137:2002, *Sterilization of health care products—Requirements for validation and routine control—Radiation Sterilization*.

This Standard has been developed to assist in the process of implementation of the Australian Medical Device Legislation.

This Standard is identical with, and has been reproduced from ISO 11137-2:2006 ISO 11137-2:2006, *Sterilization of health care products—Radiation —Part 2: Establishing the sterilization dose*.

The objective of this Standard is to specify the methods of determining the minimum dose of radiation sterilization of medical devices.

There are three parts in the series for AS/NZS 11137, *Sterilization of health care products—Radiation* as follows:

- Part 1: Requirements for development, validation and routine control of a sterilization process for medical devices
- Part 2: Establishing the sterilization dose
- Part 3: Guidance on dosimetric aspects

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- (b) In the source text ‘this part of ISO 11137’ should read ‘this Australian/New Zealand Standard’
- (c) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>	<i>Australian or Australian/New Zealand Standard</i>
ISO	AS/NZS ISO
11137 Sterilization of health care products— Radiation	11137 Sterilization of health care products— Radiation
11137-1 Part 1: Requirements for development, validation and routine control of a sterilization process for medical devices	11137.1 Part 1: Requirements for development, validation and routine control of a sterilization process for medical devices
	AS ISO
13485 Medical devices— Quality management systems— Requirements for regulatory purposes	13485 Medical devices— Quality management systems— Requirements for regulatory purposes

Only international references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

The term ‘informative’ has been used in this Standard to define the application of the annex to which it applies. An ‘informative’ annex is only for information and guidance.

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INTRODUCTION

This part of ISO 11137 describes methods that may be used to establish the sterilization dose in accordance with one of the two approaches specified in 8.2 of ISO 11137-1:2006. The methods used in these approaches are:

- a) dose setting to obtain a product-specific dose;
- b) dose substantiation to verify a preselected dose of 25 kGy or 15 kGy.

The basis of the dose setting methods described in this part of ISO 11137 (Methods 1 and 2) owe much to the ideas first propounded by Tallentire (Tallentire, 1973 [17]; Tallentire, Dwyer and Ley, 1971 [18]; Tallentire and Khan, 1978 [19]). Subsequently, standardized protocols were developed (Davis *et al.*, 1981 [8]; Davis, Strawderman and Whitby, 1984 [9]) which formed the basis of the dose setting methods detailed in the AAMI *Recommended Practice for Sterilization by Gamma Radiation* (AAMI 1984, 1991 [4], [6]).

Methods 1 and 2 and the associated sterilization dose audit procedures use data derived from the inactivation of the microbial population in its natural state on product. The methods are based on a probability model for the inactivation of microbial populations. The probability model, as applied to bioburden made up of a mixture of various microbial species, assumes that each such species has its own unique D_{10} value. In the model, the probability that an item will possess a surviving microorganism after exposure to a given dose of radiation is defined in terms of the initial number of microorganisms on the item prior to irradiation and the D_{10} values of the microorganisms. The methods involve performance of tests of sterility on product items that have received doses of radiation lower than the sterilization dose. The outcome of these tests is used to predict the dose needed to achieve a predetermined sterility assurance level, SAL.

Methods 1 and 2 may also be used to substantiate 25 kGy if, on performing a dose setting exercise, the derived sterilization dose for an SAL of 10^{-6} is ≤ 25 kGy. The basis of the method devised specifically for substantiation of 25 kGy, Method VD_{max} , was put forward by Kowalski and Tallentire (1999) [14]. Subsequent evaluations involving computational techniques demonstrated that the underlying principles were soundly based (Kowalski, Aoshuang and Tallentire, 2000) [13] and field trials confirmed that Method VD_{max} is effective in substantiating 25 kGy for a wide variety of medical devices manufactured and assembled in different ways (Kowalski *et al.*, 2002) [16].

A standardized procedure for the use of VD_{max} for substantiation of a sterilization dose of 25 kGy has been published in the AAMI Technical Information Report *Sterilization of health care products — Radiation sterilization — Substantiation of 25 kGy as a sterilization dose — Method VD_{max}* (AAMI TIR27:2001) [5], a text on which the method described herein is largely based. Method VD_{max} is founded on dose setting Method 1 and, as such, it possesses the high level of conservativeness characteristic of Method 1. In a similar manner to the dose setting methods, it involves performance of tests of sterility on product items that have received a dose of radiation lower than the sterilization dose. The outcomes of these tests are used to substantiate that 25 kGy achieves an SAL of 10^{-6} .

To link the use of VD_{max} for the substantiation of a particular preselected sterilization dose, the numerical value of the latter, expressed in kGy, is included as a superscript to the VD_{max} symbol. Thus, for substantiation of a sterilization dose of 25 kGy the method is designated VD_{max}^{25} .

Method VD_{max}^{15} is based on the same principles as Method VD_{max}^{25} described above. The test procedure is the same as Method VD_{max}^{25} , but VD_{max}^{15} is limited to product with average bioburden ≤ 1.5 . The outcomes of these tests are used to substantiate that 15 kGy achieves a sterility assurance level of 10^{-6} .

This part of ISO 11137 also describes methods that may be used to carry out sterilization dose audits in accordance with ISO 11137-1:2006, Clause 12. Following establishment of the sterilization dose, sterilization dose audits are performed routinely to confirm that the sterilization dose continues to achieve the desired SAL.

AUSTRALIAN/NEW ZEALAND STANDARD

Sterilization of health care products — Radiation —**Part 2:
Establishing the sterilization dose****1 Scope**

This part of ISO 11137 specifies methods of determining the minimum dose needed to achieve a specified requirement for sterility and methods to substantiate the use of 25 kGy or 15 kGy as the sterilization dose to achieve a sterility assurance level, SAL, of 10^{-6} . This part of ISO 11137 also specifies methods of dose auditing in order to demonstrate the continued effectiveness of the sterilization dose.

This part of ISO 11137 defines product families for dose establishment and dose auditing.

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 11137-1:2006, *Sterilization of health care products — Radiation — Part 1: Requirements for the development, validation and routine control of a sterilization process for medical devices*

ISO 11737-1, *Sterilization of medical devices — Microbiological methods — Part 1: Determination of the population of microorganisms on product*

ISO 11737-2, *Sterilization of medical devices — Microbiological methods — Part 2: Test of sterility performed in the validation of a sterilization process*

ISO 13485, *Medical devices — Quality management systems — Requirements for regulatory purposes*

3 Abbreviations, terms and definitions

For purposes of this document, the terms and definitions given in ISO 11137-1 and the following apply.

3.1 Abbreviations**3.1.1***A*

dose to adjust the median ffp dose downwards, to the FFP dose

3.1.2*CD**

number of positive tests of sterility obtained from tests performed individually on 100 product items irradiated in a Method 2 verification dose experiment