



MALAYSIAN STANDARD

MS ISO 16000-16:2011

INDOOR AIR - PART 16: DETECTION AND ENUMERATION OF MOULDS - SAMPLING BY FILTRATION (ISO 16000-16:2008, IDT)

ICS: 13.040.20

Descriptors: indoor air, detection, enumeration, moulds, sampling by filtration

© Copyright 2011

DEPARTMENT OF STANDARDS MALAYSIA

DEVELOPMENT OF MALAYSIAN STANDARDS

The **Department of Standards Malaysia (STANDARDS MALAYSIA)** is the national standards and accreditation body of Malaysia.

The main function of STANDARDS MALAYSIA is to foster and promote standards, standardisation and accreditation as a means of advancing the national economy, promoting industrial efficiency and development, benefiting the health and safety of the public, protecting the consumers, facilitating domestic and international trade and furthering international cooperation in relation to standards and standardisation.

Malaysian Standards (MS) are developed through consensus by committees which comprise balanced representation of producers, users, consumers and others with relevant interests, as may be appropriate to the subject at hand. To the greatest extent possible, Malaysian Standards are aligned to or are adoption of international standards. Approval of a standard as a Malaysian Standard is governed by the Standards of Malaysia Act 1996 [Act 549]. Malaysian Standards are reviewed periodically. The use of Malaysian Standards is voluntary except in so far as they are made mandatory by regulatory authorities by means of regulations, local by-laws or any other similar ways.

STANDARDS MALAYSIA has appointed **SIRIM Berhad** as the agent to develop, distribute and sell the Malaysian Standards.

For further information on Malaysian Standards, please contact:

Department of Standards Malaysia
Ministry of Science, Technology and Innovation
Level 1 & 2, Block 2300, Century Square
Jalan Usahawan
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel: 60 3 8318 0002
Fax: 60 3 8319 3131
<http://www.standardsmalaysia.gov.my>

E-mail: central@standardsmalaysia.gov.my

OR **SIRIM Berhad**
(Company No. 367474 - V)
1, Persiaran Dato' Menteri
Section 2
40000 Shah Alam
Selangor Darul Ehsan
MALAYSIA

Tel: 60 3 5544 6000
Fax: 60 3 5510 8095
<http://www.sirim.my>

E-mail: msonline@sirim.my

CONTENTS

	Page
Committee representation	iii
National foreword.....	v
Foreword.....	vii
Introduction	ix
1 Scope.....	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	3
5 Apparatus and materials.....	3
5.1 Sampling device	3
5.2 Materials	4
6 Measurement procedure	4
6.1 Preparation for sampling	4
6.2 Sampling.....	6
6.3 Sampling period.....	6
6.4 Transport and storage	6
7 Sampling efficiency and method limitations	7
8 Calibration of flow rate, function control and maintenance of the sampling system	7
8.1 Calibration of flow rate.....	7
8.2 Function control and maintenance	7
9 Quality assurance.....	7
10 Sampling protocol.....	8
11 Performance characteristics.....	8

CONTENTS *(continued)*

	Page
Table A.1 Recovery of mould spores on different filters (Reference [10]) in an indoor environment	9
Table B.1 Physical parameters.....	11
Table D.1 Results ^a of the sample exchange of gelatine/polycarbonate-filters subsequent to ambient air measurements at different locations	17
Figure 1 Schematic setup of the sampling device.....	5
Figure A.1 Characteristic filter curves of a gelatine filter	10
Figure A.2 Characteristic filter curves of a polycarbonate filter	10
Figure B.1 Sampling head with filter holder.....	12
Figure B.2 Disposable filter holder	13
Figure D.1 Results of mean colony counts after sampling in a meeting room with different sampling devices during trial 1	18
Figure D.2 Results of mean colony counts after sampling in a meeting room with different sampling devices during trial 2	19
Annex A Recovery of spores on gelatine filters in combination with polycarbonate filters.....	9
Annex B Technical description of a suitable filtration device.....	11
Annex C Sampling protocol	14
Annex D Trials for method validation.....	16
Bibliography	20

Committee representation

The Industry Standards Committee on Environmental Management (ISC Z) under whose authority this Malaysian Standard was adopted, comprises representatives from the following organisations:

Association of Consulting Engineers Malaysia
Association of Environmental Consultants and Companies of Malaysia
Balai Ikhtisas Malaysia
Business Council for Sustainable Development Malaysia
Centre for Environment Technology and Development Malaysia
Department of Environment
Department of Standards Malaysia
Environmental Management and Research Association of Malaysia
Federation of Malaysian Manufacturers
Malaysian International Chamber of Commerce and Industry
Malaysian Nuclear Agency
Malaysian Palm Oil Association
Malaysian Palm Oil Board
Malaysian Palm Oil Council
Malaysian Plastics Manufacturers Association
Malaysian Rubber Board
Malaysian Rubber Glove Manufacturers' Association
Malaysian Textile Manufacturers Association
Ministry of Domestic Trade, Co-operatives and Consumerism
Ministry of Housing and Local Government
Ministry of International Trade and Industry
Ministry of Natural Resources and Environment
Ministry of Plantation Industries and Commodities
Ministry of Science, Technology and Innovation
SIRIM Berhad (Environmental and Bioprocess Technology Centre)
SIRIM Berhad (Secretariat)
The Electrical and Electronics Association of Malaysia
The Institution of Engineers, Malaysia
Universiti Malaya
Universiti Putra Malaysia

The Technical Committee on Air Quality which supervised the adoption of ISO Standard as Malaysian Standard consists of representatives from the following organisations:

Alam Sekitar Malaysia Sdn Bhd
Association of Environmental Consultants and Companies of Malaysia
Department of Chemistry, Malaysia
Department of Environment
Department of Occupational Safety and Health Malaysia
Malaysian Industrial Hygiene Association
Malaysian Meteorological Department
Malaysian Nuclear Agency
Ministry of Health Malaysia
SIRIM Berhad (Secretariat)
The Institution of Engineers, Malaysia
Universiti Kebangsaan Malaysia
Universiti Malaya
Universiti Putra Malaysia

MS ISO 16000-16:2011

Committee representation *(continued)*

The Working Group on Workplace Atmosphere and Indoor Air which recommended the adoption of the ISO Standard as Malaysian Standard consists of representatives from the following organisations:

Association of Environmental Consultants and Companies of Malaysia

Department of Chemistry, Malaysia

Department of Environment

Department of Occupational Safety and Health Malaysia

Hospital Tengku Ampuan Rahimah

Institute for Medical Research

Malaysia Chapter, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc

Malaysian Institute of Chemistry

Ministry of Health Malaysia (Engineering Services Division)

National Institute of Occupational Safety and Health

SIRIM Berhad (Environment Technology Research Centre)

SIRIM Berhad (Secretariat)

The Institution of Engineers, Malaysia

Universiti Malaya

NATIONAL FOREWORD

The adoption of the ISO Standard as a Malaysian Standard was recommended by the Working Group on Workplace Atmosphere and Indoor Air under the authority of the Industry Standards Committee on Environmental Management.

This Malaysian Standard is identical with ISO 16000-16:2008, *Indoor air - Part 16: Detection and enumeration of moulds - Sampling by filtration*, published by the International Organization for Standardization (ISO). However, for the purposes of this Malaysian Standard, the following apply:

- a) in the source text, "this International Standard" should read "this Malaysian Standard";
- b) the comma which is used as a decimal sign (if any), to read as a point;
- c)

Clause/Subclause	Modifications
6 Measurement procedure	Replace the title "Measurement procedure" with "Procedure"

Explanation: The subsequent sub-clauses specify sampling procedures only and not measurement procedure. Addition to that, the changes are made in order to harmonise with the other parts of the series.

- d) reference to International Standards should be replaced by corresponding Malaysian Standards as follows:

<u>Referenced International Standards</u>	<u>Corresponding Malaysian Standards</u>
ISO 16000-17, <i>Indoor air - Part 17: Detection and enumeration of moulds - Culture-based method</i>	MS ISO 16000-17, <i>Indoor air - Part 17: Detection and enumeration of moulds - Culture-based method</i>

MS ISO 16000 consists of the following parts, under the general title *Indoor air*:

Part 1: General aspects of sampling strategy

Part 2: Sampling strategy for formaldehyde

Part 3: Determination of formaldehyde and other carbonyl compounds - Active sampling method

Part 4: Determination of formaldehyde - Diffusive sampling method

Part 5: Sampling strategy for volatile organic compounds (VOCs)

Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA[®] sorbent, thermal desorption and gas chromatography using MS/FID